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NOTES ON MUNICIPAL GOVERNMENT

Port Administration and Harbor Facilities

A SYMPOSIUM

- New York City.**—J. A. BENSEL, Commissioner of Docks and Ferries, New York City.
- Chicago.**—FREDERIC REX, Assistant City Statistician, Chicago, Ill.
- Philadelphia.**—WARD W. PIERSON, University of Pennsylvania.
- Boston.**—CHARLES H. SWAN, Boston, Mass.
- Buffalo.**—F. HOWARD MASON, Secretary of Chamber of Commerce, Buffalo, N. Y.
- New Orleans.**—JAMES J. McLOUGHLIN, New Orleans, La.
- Detroit.**—DELOS F. WILCOX, PH.D., Secretary of Municipal League, Detroit, MICH.
- Washington, D. C.**—DANIEL E. GARGES, Secretary Committee on Wharves, District of Columbia.
- Providence.**—FRANK E. LAKEY, Providence, R. I.
- Wilmington, Del.**—WILLIAM COYNE and JOHN N. LAWSON, JR., Wilmington.
- Duluth.**—ALFRED MCCALLUM, Duluth, Minn.
- Tampa.**—J. D. CALHOUN, Secretary of Board of Trade, Tampa, Fla.
- London, England.**—PROF. J. RUSSELL SMITH, University of Pennsylvania.
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NEW YORK CITY

By J. A. BENSEL, Commissioner of Docks and Ferries, New York City.

The character and extent of the shipping which enters and leaves New York is very diverse in its character and comprises practically all the trades from that of a small fishing boat to the largest transatlantic liner. The total foreign commerce of the port for the year 1906 was \$1,460,812,356 in value, while the total of all ports of the United States was \$3,215,533,870.

The harbor of Greater New York comprises an extent of about 450 miles of water front of such a character as to provide safe accommodations for vessels of all classes, and docks of such water depth as to allow the unload-

ing directly from the ship to the dock and *vice versa* without trouble, so far as weather conditions are concerned. The extent of the harbor above referred to includes the Boroughs of Brooklyn, Queens, Manhattan, the Bronx and Staten Island (or the Borough of Richmond) which, in length of waterfront, might be specified as follows: Manhattan, 40 miles; Bronx, 105 miles; Brooklyn, 132 miles; Queens, 116 miles; Richmond, 51 miles.

But only 125 miles of water front is available for ocean traffic.

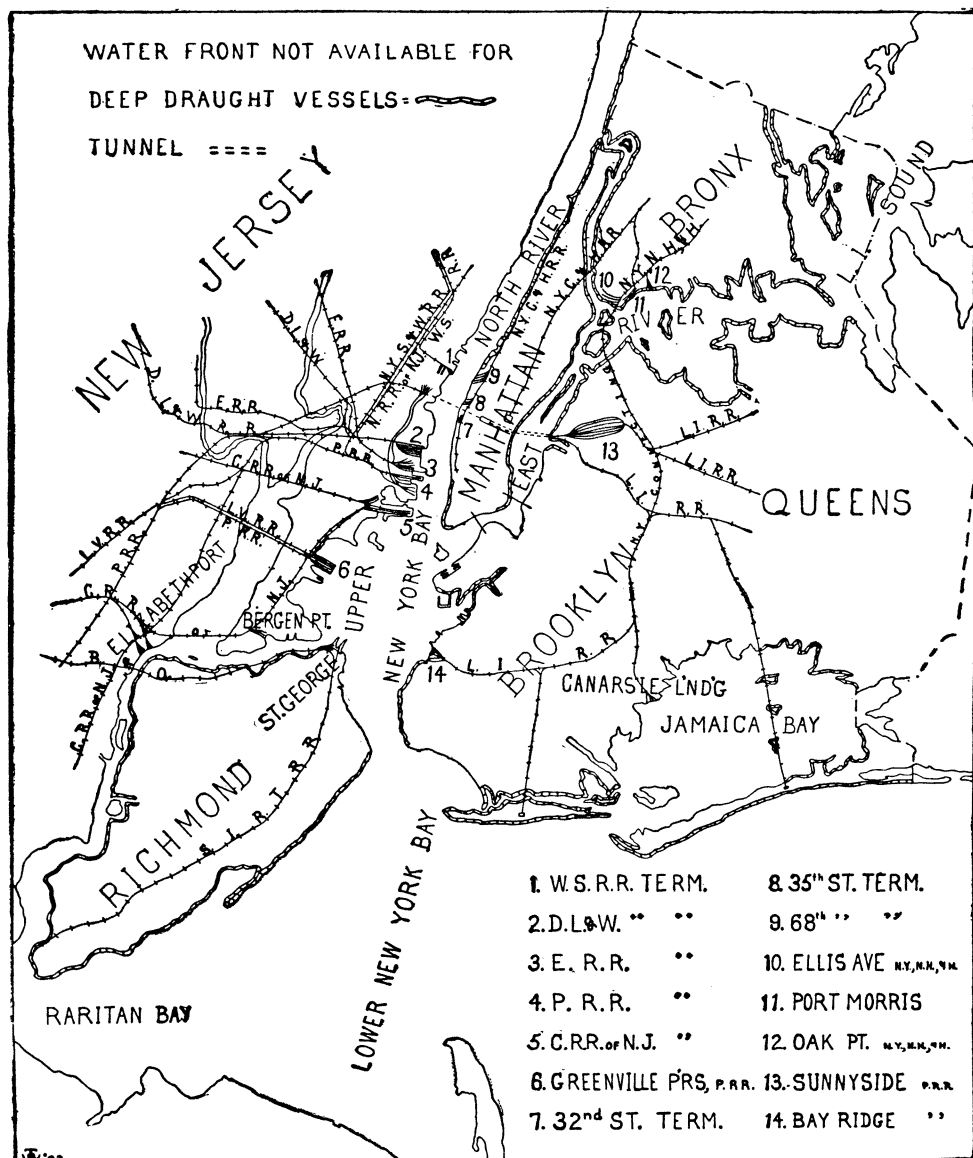
	Manhattan Miles	Bronx Miles	Brooklyn Miles	Queens Miles	Rich- mond Miles	Totals Miles
Available for Ocean Traffic . . .	7.50	..	101.10	13.25	3.25	125.10
Not available for Ocean Traffic.	32.40	105.60	31.20	102.75	47.75	319.70
Used by Railroads	2.22	1.80	0.08	0.63	0.60	5.33
Used by Foreign Steamships...	1.31	..	2.15	..	0.15	3.61
Used by Domestic Steamships..	0.96	..	2.00	..	0.15	3.11
Used for General and Miscellaneous Wharfage	7.83	2.51	20.14	11.20	5.60	47.28
Reserved for Parks	7.01	11.34	2.65	23.00
Reserved for U. S. Government	0.04	..	2.17	..	0.80	3.01
Total	39.90	105.60	132.30	116.00	51.00	444.80

For transatlantic shipping, the facilities are available along nearly the whole extent of the westerly side of Manhattan Island, a portion of the southerly side below the Brooklyn Bridge, and a portion of the Borough of Brooklyn extending for about five miles south of the Brooklyn Bridge.

In these locations, the nature of the shore and harbor is such as to allow for docking the largest vessels at present built. At other sections of the waterfront of Greater New York the conditions are such as to allow considerable use of the waterfront for railroad purposes, and for boats plying on the rivers and canals, and, in connection therewith, the local uses, such as transporting supplies, building material, grain, feed, etc. A considerable portion of the waterfront is also at present laid out as a park system, which is principally that reaching from the northly end to the center of the western shore of Manhattan Island, and a portion of the Borough of the Bronx.

At the present writing the city owns almost all the waterfront in the Borough of Manhattan, with a small ownership in the Borough of Brooklyn and in the Borough of the Bronx, and practically no ownership in the Borough of Richmond. The Borough of Richmond, although of large extent in waterfront, has only a small portion which is available at present for commercial development on account of the exposed condition of large portions of the shore along the southerly and easterly sides of the Island, and the hampering conditions to the size of piers which could be built, and the intensity of the current along what is known as the "Kill" side, that is, the northerly and westerly sides of the Island.

Manhattan Island is practically all developed for commercial use. Outside of the Jamaica Bay district, which is now being examined, the Borough



of Brooklyn has one-third of its waterfront available for commercial use. About one-half of the waterfront of the Borough of Queens is available while the Bronx is developed only to a small extent. The Borough of Richmond is developed to the extent of about one-third of its total length of waterfront.

Organized in 1870, the Department of Docks and Ferries has operated for the condemnation and improvement of the waterfront, starting first on Manhattan Island. Since the establishment of Greater New York, it has operated over the whole of the Greater City. The purpose of organization is the condemnation and use for the municipality of the waterfront, now to a great extent (except on Manhattan Island) held in private hands. The state at the present time has an ownership in the lands under the water lying outshore of the waterfront itself to some extent in the boroughs of Richmond, Brooklyn and Queens, the state having, in the boroughs of Manhattan and the Bronx, made over its ownership in the lands under water to the city about 1876.

The management of this water front is vested by law in the Commissioner of Docks, who holds office at the pleasure of the Mayor. The Commissioner has general jurisdiction and power of government, but he cannot lease property except with the approval of the Sinking Fund Commission.

The operation of municipal ferries which is now being taken up, is an addition to the previous duties of the Commissioner of Docks, and at the present time the city is operating, through the Dock Commissioner, the ferry from the foot of Whitehall Street, Manhattan, to Thirty-ninth Street, Brooklyn, and from the foot of Whitehall Street to St. George, Staten Island.

The officers who directly control the waterfront in so far as the berthing of vessels is concerned, are known as dockmasters, having practically all the powers formerly vested in the state harbormasters in the administration and direct government of the waterfront. These dockmasters are appointed through the civil service by the Commissioner of Docks.

The income of the department at present amounts to about \$4,000,000 a year, the larger portion of it being from property leased to individuals, corporations and companies occupying the city's piers and bulkheads. All funds received by the Dock Department go to the sinking fund for the redemption of the city debt.

The expenditures of the department are provided for from bond issues amounting to not over \$5,000,000 per year, except by the concurrent resolution of the Board of Estimate and Apportionment and the Board of Aldermen.

CHICAGO

By FREDERIC REX, Assistant City Statistician, Chicago, Ill.

The harbor of Chicago consists of the Chicago and Calumet rivers, with their branches, forks and slips, the drainage canal and the waters of Lake Michigan for a distance of three miles from the shore between the north and south boundary lines of the city.

To say that Chicago's harbor is its extended lake front is a misnomer, save for an "outer" or "Chicago Harbor," which, by the construction of a series of sheltering breakwaters, facilitates approach to the Chicago river. On good authority it has been argued that the city's harbor should have been created in the lake, yet the fact remains that by a direct inversion of the fitness of things commerce has overlooked its opportunity and found and made the harbor of the city in the Chicago and Calumet rivers.

The Chicago River, which, with the Calumet, constitutes the inner and actual harbor of the city, one mile from its mouth bifurcates, forming its north and south branches, the length of the main stream and its branches being about sixteen miles. Originally a stagnant stream with but little flow and having a maximum depth of 16 to 18 feet, with a variable width, it has been slightly widened in its narrowest parts by the federal government and systematically widened in its south branch by the Chicago sanitary district, rendering it navigable by vessels of 20 feet draft entering from the lake for the full length of the main river with the exception of a tunnel obstruction three-quarters of a mile from its mouth which limits safe navigation to a depth of sixteen feet.

The south branch, which has been widened and deepened by the sanitary district at an expense of over \$2,000,000, has a navigable depth of twenty feet for a distance of six miles, with the exception of two tunnel obstructions, which similarly restrict navigation. Inasmuch as the tunnels were by act of Congress declared "unreasonable obstructions to navigation" the Secretary of War last year ordered them removed or lowered so that there shall be a clear depth of twenty-two feet over them at low water. The work of lowering is now in progress, with an assurance of its completion before the beginning of this year's navigation season.

The south branch, being the main artery pulsating with the city's commercial activity, six miles south of its junction, connects with the sanitary and ship canals, which in turn joins the Des Plaines River twenty-eight miles distant and thence carries the water of Lake Michigan through the Illinois River into the Mississippi. Having a width varying from 160 to 290 feet and a depth of 22 feet, its value as an aid to the city's commerce will be most felt after an estimated outlay by the government of approximately \$70,000,000 on a deep waterway project, entailing extensive improvements along the rivers connecting Chicago with the Gulf of Mexico. The north branch of the Chicago river is navigable by sixteen feet draft vessels for about six miles.

It has been the aim to secure a uniform width of 200 feet in the main river and its south branch, and a clear navigable width of 140 feet through the draws of all bridges. It seems probable that this improvement will be completed within the next two years.

The Calumet river, about ten miles south of the mouth of the Chicago river and its active rival for the city's trade, has been described by Major Marshall, government engineer and a competent witness, as the "finest harbor on Lake Michigan." Of humble beginnings and used by small draft vessels only, it has by virtue of government favor been made navigable for

the largest draft vessels on the Great Lakes, having a depth of twenty-two feet and a variable width of from 200 to 300 feet.

The waterfront of the Chicago River is irregular, there being no clear delimitation of dock lines. Business firms have constructed docks jutting from one to six feet into the river beyond the line of neighboring docks, such construction either being due to intentional encroachments or unrestricted assertion of riparian rights. On the Calumet River, although no dock lines have been established by the city authorities, the federal government has established a uniform channel beyond which it has refused permits for docks. Center pier bridges still detract from the appearance of the harbor front, but it has been the tendency of the sanitary district to supplant them with improved bascule, or rolling lift bridges, as fast as time and money will permit. The possibilities of Chicago's lake shore have often excited the speculation of the visiting traveler, and justly so. However, as the title to the submerged lands under Lake Michigan is in the State of Illinois, the city itself is unable to prevent aggressions upon the same by private parties. Valuable acres of "made" land along our lake shore are to-day possessed by individuals and corporations because the city could not assert its rights and the state was passive.

Shipping activity in the port of Chicago has been practically at a standstill for the past ten years, and while easily accounted for, presents some interesting facts showing the gradual transition from the construction of freight-carrying vessels on the Great Lakes, having a draft below sixteen feet to great steel steamers having an average draft of twenty feet. In 1890 the tonnage of 18,472 vessels entering into and clearing from the Chicago River was 8,774,156, having an average cargo of 475 tons, while 1,661 vessels arriving in and clearing from the Calumet River had a total tonnage of 1,341,895, or an average of 808 tons. The difference is apparent when the carrying trade of the two rivers is compared for 1906. 11,650 vessels discharging and re-loading cargo in the Chicago River last year had an average cargo of 858 tons while the 1,947 vessels in the Calumet had an average cargo of 2,776 tons. In 1889 less than ten per cent of the total tonnage of the port of Chicago entered and cleared from the Calumet, while in 1906, with barely one-sixth of the number of vessels entering and clearing from the Chicago River, it had a little over one-half the tonnage. This condition of affairs would appear anomalous but for the fact that the vessels entering the Chicago River are, and must necessarily be, vessels of small draft, and consequently small tonnage, owing to the presence in the river of three tunnels, which, although as before stated, in process of being lowered, have limited safe navigation in the river to a draft of about sixteen feet. To show how much the trade of Chicago has suffered and the proximate cause of such loss one may quote from Hon. O. H. Ernst, of the United States Corps of Engineers, who says in a report made to the Chief of Engineers, May 26, 1904: "It seems to me evident that the trade of the Chicago River was bound to decline when the stream ceased to have the capacity necessary to accommodate the large modern freight carriers. Obstructions in the river, such as encroaching docks, center pier bridges and tunnels become more and more serious as the size of vessels

increases. They have now reached the stage where the largest and most economical freight carriers cannot use the Chicago River at all except near its mouth. Such vessels draw about twenty feet. The depth of water over the tunnels is about seventeen feet in two cases and about eighteen in the third, which limits safe navigation to a draft of about sixteen feet. Large vessels may with difficulty get by the other obstructions just mentioned but they cannot get over the tunnels. The tunnels are the most serious obstructions in the river and must, I think, be charged with the greater part of the loss of trade. It is certainly useless to hope for its restoration before they are altered. It is more probable that the decay of the river traffic will continue until that is done, notwithstanding that the other obstructions—center pier bridges and encroaching docks—are being systematically removed by the trustees of the sanitary district. If the extent of the injury could be measured in money, the amount would undoubtedly be stated in millions.”

As an example of how great an “old man of the sea” the tunnels have been to the Chicago River it may be instanced that often shippers of grain have bid two and one-half cents per bushel freight to Buffalo, notwithstanding that at Milwaukee and in the Calumet River there was a surplus of vessels at one and three-quarter cents, merely because the large steel freighters, plentiful at Milwaukee and South Chicago, could not gain entrance into the Chicago River to take cargo. In addition the smaller boats are rapidly being forced from the Great Lakes, generally being old and unseaworthy, carrying increased rates of insurance, and it has been predicted that within the next two or three years there will scarcely be five per cent of the ships on the lakes able to take a full cargo out of the Chicago River. Nevertheless its commerce during the past year amounted to 10,000,580 tons, the principal items being grain, lumber, coal and salt, while that of the Calumet River was 5,404,620 tons, principally iron ore, grain and coal. Because of its accessibility to great freighters its trade is constantly increasing and new manufacturing plants are steadily occupying the river banks as fast as the twenty-foot depths are carried upstream. This sub-port of the city is a great factor in controlling freight rates, effecting a saving of at least fifty cents per ton over the Chicago River rates and considerably more over the current South Chicago railroad rates. As soon as the obstructions which now impede the progress of the Chicago River shall have been removed and the stream placed on an equal footing with the deep and broad Calumet, then the port of Chicago will in a very short time surpass the water-carrying trade of New York. It even now, although greatly handicapped, nearly equals the commerce of that port.

The facilities provide for the handling of cargoes are naturally greatly dependent on individual or corporate initiative and enterprise. On most docks improved machinery and methods of handling cargoes are used. Cargoes of 100,000 bushels of grain are loaded within five hours and unloaded in six hours. In one instance, it is stated, that a cargo of 100,000 bushels of grain was unloaded with a loss of but two bushels. It takes but three hours to load a cargo of 5,000 tons of ore. Coal drops from the car-dumping machines or conveyancers into the holds of vessels, which three hours after tying up at the dock

are ready to sail with a cargo of from 3,000 to 5,000 tons. The economic handling of freight has attained a high state of perfection.

The only property along the Chicago and Calumet rivers which may be described as public property are the street stub ends along the river front belonging to the city, some 2,500 feet of dock constructed by the Chicago sanitary district on the south branch of the Chicago River, and the entire fifty miles of dock frontage along the sanitary and ship canal. The large number of other docks along these rivers are owned by private parties, there being approximately forty-five miles of private dock on the Chicago River and ten miles on the Calumet.

To enable the city authorities to handle the dock question satisfactorily in the future, the Rivers and Harbors Committee of the Chicago Charter Convention in 1906 submitted to the latter a bill authorizing municipalities to own, construct and operate "docks, wharves, elevators and warehouses" as well as "railroad tracks and machines" to operate the same, with the right to issue bonds for their acquisition and maintenance, with the recommendation that the charter convention memorialize the State Legislature for its passage.

Representative Kittleman, in speaking on the committee's recommendation, said: "I say frankly, with reference to the matter before us, that there is nothing in the charter convention that means more to the city commercially than the establishment of docks in a great harbor. If there is no other way of getting it then I would be in favor of the city owning, establishing and controlling these docks, so that Chicago would become what it ought to be, one of the greatest markets in the world." Mr. Joseph Medill Patterson, until recently Commissioner of Public Works of Chicago, one of the chief proponents of such municipal docks, states that the same, if constructed, could be leased for enough to pay the interest on the bonds and to create a sinking fund for the extinguishment of the original investment. Such a plan could not be considered radical. It would be merely applying historic bourgeois craftiness to a state of affairs where the community could engage in an enterprise to better advantage than a private individual. The realization of profits is not the chief end of a system of municipal docks. Save that it should not become a burden to the city its purpose ought to be the development of the business and prosperity of the port.

The harbor officials of the port of Chicago consist of a harbor engineer, who holds office under the civil service law, a harbor master, vessel dispatcher and numerous bridge tenders, who are appointed by the Mayor by and with the consent of the City Council. There are also a large number of assistants to these officials, a number of whom are civil service appointees, while others are exempt from the operations of the law. These officials, by the provisions of the city ordinances, have a jurisdictional supervision over the water area of the Chicago Harbor. They are required to keep the docks, bridges and other property belonging to the city free from damage; maintain a record of the movement of all vessels navigating the harbor; regulate the opening and closing of the bridges for the passage of vessels; provide vessel signals; report upon the safe or unsafe condition of private wharves and docks and require all private parties to secure permits for the construction

of the same; prevent all encroachments on harbor lines and remove all obstructions from the river.

The administrative work of the city's harbor officials is hampered and retarded in usefulness by the straightened conditions of the city's finances. While in New York the Department of Docks has floating property valued at about half a million dollars, consisting of derrick boats, steam tugs, steam and naphtha launches and the like, the harbor master and engineer of Chicago find themselves without even a moderately fast dispatch boat for inspecting and patrolling the harbor. It has been said that the Chicago harbor engineer, on a voyage of inspection, is expected to cruise about in a row boat among the ore-carrying monsters of the steel fleet in the waters of the Calumet. The doctrine of *laissez faire* certainly has had a liberal application in our western city, it having been well-directed policy on the part of special interests to keep its waters as free from restrictions and interference as the complaisance of municipal officials and the community would permit.

There are no wharfage charges fixed by city ordinance nor are any levied by the city harbor officials. The only revenue derived by the city along its lake and rivers is from rentals paid by private concerns for the use of street stub ends abutting the same. Formerly the revenue obtained from these stub ends was not very substantial or satisfactory, nearly always resulting in a loss to the public treasury. It has, however, been the policy of the present administration to exact compensation for all private uses of public property, and during 1906 nearly \$15,000.00 were realized from the rental of these stub ends. The amount expended in 1905 for dock and street stub end renewals was \$20,000, the sum received from rentals being slightly less than in 1906. Clearly the city in 1905 lost money from this source, but then it should be remembered that it is put to the expense of maintaining a large number of street stubs which it does not rent or use. The Chicago Sanitary District has come into possession of 2,500 feet of dock along the south branch whose value this year will be \$29,053.24, based upon proposals for leases now before its officials. The district recently has called for bids for leases on its sanitary and ship canal, it being the anticipation of its officials to secure a net return of \$500,000 from this source annually, within the next two years, with an eventual aggregate maximum income of \$1,500,000 per year.

In conclusion, our local rivers, aside from being utilized merely as highways of water transportation should, similarly to European cities, exhibit a water front to which the denizen may point as the most ornamental section of his city. Chicago still is making great forward strides in population and wealth. Surely it is but the part of wisdom, of comprehensive, expansive municipal statesmanship to devise plans of improving its rivers and lake, to build not for the day or the morrow, but for posterity. Let the experience of the great cities of the old world be its example. The improvements, which, if made, would cost the present generation comparatively a trifle, will, if delayed, cause the next the expenditure of vast sums. Where, to-day, our river front displays decaying wooden docks and wooden warehouses stand-

ing on the water's edge, the future may bid us hope to find a spacious stream, nowhere less than 250 feet in width, bordered by straight and regular concrete or stone docks, with bascule bridges sweeping across its full width. Turning aside from this comprehensive scheme of improvement to matters lying nearer our own hands, a complete survey of the lake shore and rivers should be made by competent engineers, and after a concurrent conference between the sanitary district, federal government and city authorities, an inclusive and harmonious plan of dock lines be reported and embodied in an ordinance to be passed by the City Council. Because of the city's close interest in the contiguous submerged lands in Lake Michigan and it being a matter which concerns the municipality solely, the State Legislature should be requested to vest its present title to the same in the City of Chicago. This will enable the city to deal with a problem which, under the ownership of the submerged lands by the state has enabled private parties to surreptitiously divest the city of considerable portion of its splendid lake front.

The authorization of the city by the State Legislature to own and operate municipal docks would enhance the prosperity and business of the port to an extent beyond belief. Where to-day the private docks are numerous, ill-constructed and without co-operation, municipal docks here, as in New York, would not only offer a uniform plan for the advancement of commerce but provide good, substantial and cheap places for the handling of cargoes.

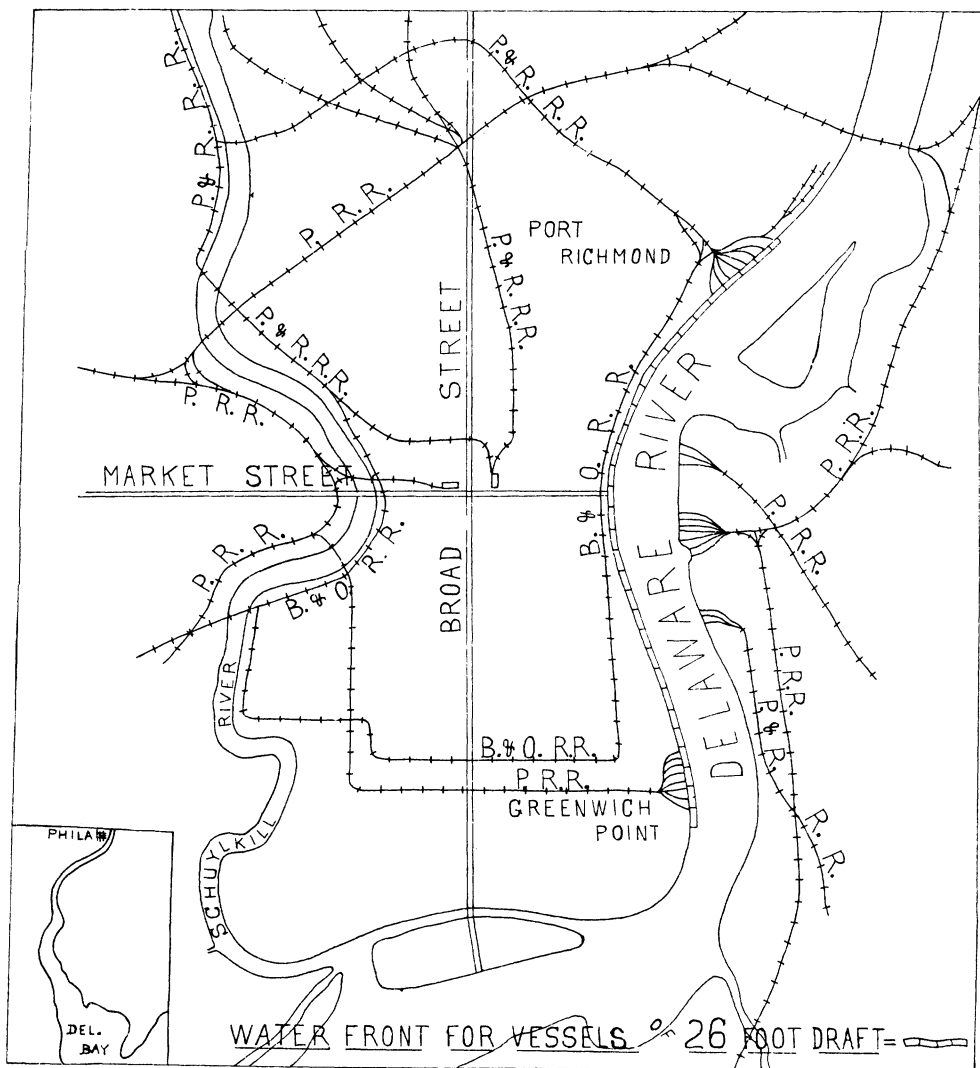
With the removal of the river tunnels and center pier bridges, the dredging of the river to a regular depth of twenty-six feet and width of 200 feet or more, as well as using the Chicago River as the connecting link in deep waterway communication via the Chicago sanitary and ship canal and the Illinois and Mississippi rivers to the Gulf, the port of Chicago will not only be the chief factor in the trade of the Great Lakes but bids fair to become a sea-port of the first magnitude and the great central market of our continent.

PHILADELPHIA

By **WARD W. PIERSON**, University of Pennsylvania.

As the third most populous city in the United States, Philadelphia should be one of the leaders in American trade and enterprise, yet her foreign import and export trade last year amounted to only \$160,000,000, barely ten per cent of the trade of New York. Baltimore with but little more than one-third the population has a foreign trade of almost an equal amount. It is said that America has four great doorways to the great Atlantic highway, Boston, New York, Philadelphia and Baltimore. Philadelphia may be a doorway, but it is far from being wide open.

There is a general belief that the port of Philadelphia is by nature inferior, and this is often alleged as the reason why the commerce of the port has not increased so rapidly as that of other sea-coast cities. But, on the other hand, Philadelphia, for natural reasons, should be the best port on



the Atlantic seaboard. Situated well inland, 102 miles from the sea, on a broad, straight river, close to the center of one of America's great farming districts, the foundation for a steady agricultural trade is well laid. In addition to this Philadelphia is a terminus of a great railroad, the Pennsylvania, with 7,000 miles of track spreading out into the middle west and reaching into the very center of the granary of the world. Every important iron manufacturing plant in the iron and steel state is made tributary to Philadelphia by this same railroad. If there was nothing more to be said the foreign export trade of the Quaker City, in grain and iron products should be second to none in the United States. Added to all this, Philadelphia, is the terminus of the greatest of the coal roads—the Reading, which owns and controls the richest of the anthracite coal lands. The manufacturing industries of Philadelphia are more numerous and diversified than those of any other city in this country, with a single exception. Then, too, Philadelphia is ninety miles nearer to Pittsburg—the gateway to the west and its industrial centers—than is New York. It is nearer to Buffalo toward which gravitates all the commerce of the Great Lakes. It is nearer to the great oil fields of Pennsylvania and West Virginia and the terminus of many oil-pipe lines. And, as if all these advantages were not enough, Philadelphia has a further advantage of a differential freight rate over New York; but for some unknown reason the ocean freight rates via Philadelphia are higher than those via New York. With all these advantages, a natural situation unequaled—with natural monopolies without a rival either at home or abroad, Philadelphia, as a commercial city is not even second or third rate, but stands absolutely at the foot of its class.

The policy of Philadelphia is slowly changing, but that policy always has been to adhere closely to the belief that nothing is good unless it has endured for a hundred years or more. This is only too true of the attitude of many, blinded by their own private interests, to the laws which now govern the port. Not four years after the death of George Washington, the famous Port Warden Law of Pennsylvania, in reality little more than a codification of the then existing laws, was passed, and that is the law under which the port of Philadelphia is to-day administered. Laws that were made in days when steam vessels had barely been conceived in the minds of their inventors, and when a voyage across the Atlantic was a question of months, instead of days, these are the laws under which Philadelphia is endeavoring to carry on a trade with foreign nations to-day. Slight changes have been made from time to time in the original act of 1803, but these changes have been always to satisfy private interests, while the interests of the public have been permitted to grow less and less. So far as its administrative features are concerned, there stands the old system—archaic, antiquated, worn out, a monument to the past, a relic of the days of the alien and sedition laws, defying age and time.

That old law to which so much deference has been paid, and to which so little respect is due, save as we respect the dusty mummies of long forgotten ages, placed the administration of the port of Philadelphia in the hands of three authorities, a board of wardens, now eighteen in number; a harbor

master, and a master warden. The president of the board of wardens admits that they have insufficient power to meet present-day conditions. The powers of this board may be summarized briefly as follows: (1) Power to license property owners to build wharves, (2) to settle disputes, (3) to license pilots. This board was intended to be an efficient body, but it has proved to be quite the opposite. The harbor master is only a policeman and hitherto has done mostly as he has been told. The present incumbent of the office, however, is asserting all the powers that remain in this office, but he is acting under laws 104 years old, and as a result he is greatly handicapped in everything he undertakes.

The main fault lies in the fact that the authority is divided and that the officers are generally engaged in trying to do as little as possible. As a result there are to-day twenty city wharves, and there are only a few more owned by the city, at which there are but nine feet of water at low tide. So shallow, in fact, is the water alongside of these piers that the city fireboats could not get close enough to the shore to do efficient service in case of a conflagration. Theoretically, every pier in the city is open for public use; actually, along the entire waterfront there is but one covered pier at which a steamship of any considerable draft with a miscellaneous cargo can unload. The other piers are private or are leased to private parties. If the single pier just referred to happens to be engaged, a tramp steamship that does venture up the Delaware cannot dock unless some private owner will permit her to do so, and then only after the private owner has fixed his own wharfage rates, which the tramp can pay, or get out. If some one should want to open up a new steamship line from Philadelphia, there is not a single pier now from which she could begin her sailing. Some of the wharves are used as dumps and ash heaps; some as railroad yards; others are rotten and decayed and sinking below the surface of the water. There is not a single wharf, public or private, which will accommodate a vessel drawing over twenty-six feet of water, and three-fourths of them will not accommodate vessels of one-half that depth. At every point the interests of the city have been sacrificed to private or corporate interests. The law now in force requires that there shall be a certain distance between piers, but this distance may be departed from by order of the port wardens. Interests not public have been careful to purchase lands on both sides of nearly every street, and on that land to erect, close to the property line, a short pier which may or may not be used, but which, under an act of 1868, vests in that owner for all practical purposes a fee in the wharf. This precludes the city forever, except after condemnation proceedings or purchase, from becoming a competitor at that point because the street is not ordinarily more than wide enough to give the dock space required by law.

To-day the warehouses of Philadelphia are bursting with goods of all sorts and descriptions, waiting for transportation, but these goods must go out over private wharves. The belt line which extends for six miles along the river front was intended to relieve this congestion and aid the independent owners of wharves, and shippers, but, first of all, it was intended to connect the piers with each other and with the storage houses along the waterfront, so that transfers from one to the other could be made with

minimum cost and with minimum loss of time. Under present conditions the shipper can neither go upon a wharf unless he is owner or lessee, nor can a tramp vessel come alongside. If one wishes to send goods into or out of Philadelphia, he must do so by way of an established line, or consign them by way of some railroad.

At present Philadelphia possesses about eight miles of available water frontage on the Delaware, which extends from Port Richmond, the Reading terminal on the north, to Greenwich Point, the Pennsylvania terminal on the south. There is additional frontage on the Schuylkill, but it is of minor importance. The ownership of the wharves is both public and private; the control of the wharves very nearly private as the following figures will show: Of the eight miles of available water frontage on the Delaware, the City of Philadelphia owns 3,598 feet, the Pennsylvania Railroad Company owns 9,951 feet, the Philadelphia and Reading 9,200 feet, the Baltimore and Ohio 1,923 feet. The balance, 16,787 is controlled by private interests which exercise an almost complete monopoly over their wharves. These figures do not tell all, for of the 3,598 feet which the city controls, 2,196 is leased to private interests leaving 1,402 feet still under the immediate control of the city. Of the portion which is leased, sufficient is in the hands of the Pennsylvania Railroad Company to bring the total frontage under the control of that company up to about 11,000 feet, more than one-quarter of the entire Delaware frontage.

From leases and rentals of wharf property the city receives about \$68,000 annually. There are no charges for wharfage and crantage which flow into the city treasury, for there are practically no wharfage facilities whatever. Most of the leases expire between 1912 and 1915, so that if the city should desire to operate its own wharves, it would be impossible for it to do so, for at least five years.

There is practically no expense for maintenance and renewals or new construction because no effort is made upon the part of the city authorities to better the present conditions of the waterfront. At present there is a great effort being made by the members of the commerce organizations of the city, led by the Maritime Exchange, to have a new law passed by the legislature, vesting the authority heretofore residing in the harbor master, master warden and board of port wardens, in a department of the city government. This movement is being opposed by the lumber interests and some of the warehouse interests. All factions, however, are agreed that something must be done, if the port of Philadelphia is to survive.

By 1908 Philadelphia will have a thirty foot channel to the sea at low tide; Congressman Burton has committed himself to the thirty-five foot channel project. The commercial future of Philadelphia is bright, provided it meets the situation squarely and puts its own house in order; but until the harbor facilities are modernized the ocean-carrying trade must remain at a standstill.

BOSTON

By CHARLES H. SWAN, Boston, Mass.

The port of Boston is the natural outlet to the sea for eastern and northern New England and a large section of eastern Canada, particularly during the winter when the navigation of the St. Lawrence River is closed. Passenger steamers leave Boston at frequent intervals for the maritime provinces, for the cities of the Atlantic coast of the United States, for the West Indies, and for Great Britain and Mediterranean ports. Freight ships arrive and depart in large numbers bearing commerce to all parts of the world. Relatively with its position in colonial times Boston is less important as a shipping focus, but actually its trade is of great importance among the ports of the nation. The total value of the export and import trade for 1905 was \$200,000,000. Although the population of municipal Boston is only about 600,000, yet the wide area of populous suburbs within easy access gives the business community the commercial position of a city of a million and a half.

The harbor is commodious and is provided with islands and peninsulas with a very extensive waterfront as yet only partially developed. Originally the shores were composed largely of mud flats separating the deep water from the upland, but in the older parts of the city and in East Boston and South Boston much filling and wharfing have been done from time to time until now most of the harbor front within the business section and available for ready transshipment is occupied by almost continuous lines of substantial wharves. These are mostly wooden structures built upon piling and largely covered by great wooden sheds. On many of the large wharves there are good warehouses of brick and stone, mostly dating back for many years, with some new and fine structures. The facilities for handling cargoes are good, but might be greatly improved and doubtless would be if the Canadian business of the city were not hampered by the tariff. There is also much complaint about the difficulty of the entrance channels of the harbor. The largest ships have to wait for the tide.

The ownership of the wharves and the commercial waterfront of Boston is largely in private hands either individual or corporate. This is the outgrowth of gradual development from colonial conditions. In 1647 the Colony passed a celebrated ordinance declaring that private titles to shore property should extend down to low water mark but not in excess of one hundred rods from shore. This has been tested by the courts as a modification of the rule of the English law that shore property was presumed to stop at high water, but there is some reason for believing that it was a restoration of an earlier English practice which had been overthrown by the royal power. It is said that one reason for the colonial ordinance was to stimulate individual enterprise to provide wharfage facilities. At any rate from that time to the present the great bulk of wharfage in Boston and other ports of Massachusetts is in private hands. There are, however, many small public landing places reserved along the shore in scattered spots, and the City of Boston owns some wharf property, but only as isolated parcels and not as

a part of any general municipal development. Practically the city owns no waterfront other than on the parkways.

At South Boston and East Boston the commonwealth controls some of the waterfront, but it is as yet undeveloped. One large pier has been built but it has never been rented and is not shedded, nor has it at present any railway connections. The commonwealth, however, has undertaken a public development in part of the harbor, and has established harbor lines and channels and regulations about filling private flats in tide water. A large section of flats lying north of South Boston was outside of the hundred rod limit of private ownership and was therefore in the full control of the state. This the legislature some years ago directed to be filled and developed under state management and took by eminent domain a large adjoining area of private flats. This has already largely been filled in and laid out with streets and with a proposed deep-water channel for approach. The commonwealth generally retains the title to this land and has leased several parcels to private parties. The scheme is as yet in its infancy, but for the management of these and other lands of the commonwealth throughout the state there is a permanent board of harbor and land commissioners. This board has very extensive powers about filling tide waters, making harbor lines and channels, leasing state lands reclaimed for development and generally in protecting the public lands and navigation rights, but it is not strictly in any sense a board for managing the movement of shipping. Perhaps it would be well to enlarge its powers to cover the whole range of harbor facilities and navigation. So far those topics lie within state jurisdiction, but with the present system of the private ownership of wharves the more probable policy is to look directly to the federal government for such matters as exceed private facilities for management. The current river and harbor bill in Congress carries a liberal appropriation for deepening the channel.

BUFFALO

By F. HOWARD MASON, Secretary of Chamber of Commerce, Buffalo, N. Y.

Buffalo is the second city in size, population and wealth in the State of New York, and is the eastern terminus of deep-water navigation on the lakes, and western terminus of New York State's famous waterway, the Erie Canal.

The harbor facilities of Buffalo consist of an "Outer Harbor" under the jurisdiction of the federal government, and the "Inner Harbor" under the jurisdiction of the City of Buffalo.

The outer harbor has been created by the federal government by the construction of a breakwater system 25,411 feet in length, or 4.8 miles, the longest breakwater system in the world. The harbor area protected by this breakwater system covers 1,600 acres of which approximately 900 acres have a depth of eighteen feet or more. This is the largest artificial harbor in the world. Total cost of breakwater system \$4,500,000.

The inner harbor has been created by the City of Buffalo by the deepening of Buffalo River and the construction of an artificial channel known as the Buffalo Ship Canal. The Buffalo River has been improved for the distance of 2.5 miles, which, with the City Ship Canal of 1.6 miles, provides a total of 4.1 miles of dockage, on which are located elevators, freight houses, warehouses, malt houses, coal and ore docks, iron furnaces, etc. The city has now under construction a project for the further improving of Buffalo River by widening and deepening. This will provide upwards of three miles of additional water frontage.

The following table shows the increase of net registered tonnage arriving and clearing at Buffalo by lake:

Year.	Total No. of vessels arriving and clearing.	Total net registered tonnage
1850	8,444	2,744,000 tons
1870	10,625	4,158,000 "
1890	9,762	7,556,413 "
1900	9,973	10,701,222 "
1906	8,557	13,989,517 "

Canal.

Year.	Tons.
1850	500,000
1870	1,873,000
1890	1,601,000
1906	1,756,081

The principal articles received are grain, lumber, iron ore and package freight; total grain receipts for 1906 being 120,397,163 bushels; flour, 10,279,384 barrels; iron ore, 4,723,519 tons; lumber, 194,165,476 feet; shingles, number, 227,436,000. Shipments by lake: coal, 2,681,000 tons; salt, 357,390 barrels; cement, 4,377,460 packages; sugar, 2,481,287 barrels.

The outer harbor at present is largely utilized as a place of refuge and for mooring; the completion of the breakwater system, however, has been followed by the location and erection of the plants of the Lackawanna Steel Company, Buffalo and Susquehanna Furnace Company, and extensive coal and ore docks by the Pennsylvania Railroad; the frontage being controlled largely by railroads, improvements are contemplated for erection of docks and warehouses along waterfront.

Located along the inner harbor are the grain elevators for receiving grain, coal trestles for loading coal, iron ore docks for receiving and storage of iron ore, and furnaces of the Buffalo Union Furnace Company; also warehouses and freight houses for the receiving and loading of package freight.

The docks are owned and controlled by private interests except at the foot of public streets. The harbor is under the control of a harbor master appointed by the Mayor, and the city has been fortunate in having a capable official in this office.

There are no public charges for wharfage.

There is considerable water frontage along the Niagara River in Buffalo, which has not been developed to any great extent by reason of the fact that the rapids at the head of Niagara River prevent the navigation of the stream by deep draft water vessels. The United States Government has approved a plan for the construction of a ship canal and lock around the rapids at the head of Niagara River, and work is now being done upon this improvement, which, when completed, will open up for additional commercial and industrial enterprises approximately twenty miles of water frontage.

NEW ORLEANS

By JAMES J. McLOUGHLIN, New Orleans, La.

The growth of the port of New Orleans during the past ten years has been marked. The natural outlet of the great system of rivers that thread the Mississippi Valley, it of necessity receives an enormous volume of river traffic. But of late years the great railroad systems have awakened to its importance, and are vying with each other in acquiring terminal facilities there, which will link their rail transportation agencies with the rapidly increasing lines of ocean steamships which frequent its magnificent harbor. With a harbor inferior to none, an equable climate, with no snow or ice to hamper the movements of commerce, its great natural advantages are now being exploited by those who realize that we only need the proper loading and unloading facilities to make New Orleans the greatest port in America.

Character and Extent of Shipping Entering and Leaving the Port.—The improvements at the mouth of the Mississippi River, making it possible for vessels drawing thirty feet to enter, have greatly increased the tonnage entering this port. For many years the ocean tonnage has been changing. Instead of a large fleet of sailing vessels coming to this port, there are now entering a larger number of steamers, of which the tonnage is greater, but the number is less.

The extent of the commerce of the port at present, can be best given by the following extract from the report of the Commission, ending August 31, 1906, viz:

“‘Sea-going’—The number and tonnage of vessels arriving at the port for the period of this report (year ending August 31, 1906), as is shown in tabulated statement was 1,505 vessels, or a gross tonnage of 3,855,919 tons, of which 3,040,668 tons occupied the public wharves, about seventy-nine per cent of the total. The wharfage earned from these vessels was \$209,557.09, an average of six and nine-tenths (.069) cents per ton.

“‘River Traffic’—was 1,150 arrivals of steamboats, 59 transportation barges, 716 miscellaneous arrivals, consisting of flats, coal, gravel and stave barges, tugs, etc., and 2,140 arrivals of luggers, and gasoline launches engaged in the oyster, fish and vegetable trade.”

This report does not give the outgoing vessels, but the United States Customs reports, which are made up for the year ending December 31, 1906, show the following:—

Arrivals:	Number	Tonnage.
Steamers	1,428.....	2,690,673
Sailing vessels	51.....	46,455
Clearances:		
Steamers	1,466.....	2,763,842
Sailing vessels	37.....	33,662

Nature and Extent of the Harbor.—The harbor of New Orleans comprises both banks of the Mississippi River, for a distance of about fifteen miles on each side, from Westwego on the right bank to Chalmette on the left bank. Westwego is the terminal of the Texas & Pacific Railroad, and Chalmette is the terminal of the New Orleans Terminal Company, whose tracks are connected with nearly all of the railroads on the left bank of the river. The river is from one-half to three-quarters of a mile in width, and the depth within ten feet from the banks ranges from 40 to 100 feet. The harbor is well sheltered. The current of the river is not too strong for unloading in mid-stream, although most of the vessels land, broad-side, along the wharves, which are constructed on piling and extending out into the stream from 50 to 100 feet in some places. This whole wharfage front on the left bank of the river, which is the bank on which the greater part of the New Orleans population lives, is approached by streets, and by lines of railroad tracks which permit cars to come on to the wharf, loading directly into the ships.

Facilities Provided for Handling Cargoes.—On the right bank, at the Westwego wharf, which is the property of the Texas & Pacific Railroad, there are sheds, wharves and tracks, etc., capable of accommodating six or seven ocean steamers at one time. These wharves, as stated, belong to the Texas & Pacific Railroad, and are used almost exclusively for their freight shippings. About four or five miles further down on the right bank, are the terminal facilities of the Southern Pacific Railroad, which are also provided with wharves, etc., capable of accommodating four or five ocean steamers.

Several miles further down is the United States Naval Station, with its large floating dock. This dock is seldom used by the government for purposes of its own, and by consent of the government, when not used by government vessels, is utilized in repairing vessels of the merchant marine.

On the left bank of the river there are nearly five miles of public wharves, owned and operated by the Port Commission, and about one mile of private wharves owned by various railroads.

The public wharves are now being covered by steel sheds, so that freight may be loaded and unloaded in any kind of weather. About two miles of these sheds have already been constructed, and the remaining three miles will be covered within the next two years.

The mechanical appliances used for loading and unloading cargoes are the following: for sugar and molasses, a sort of endless chain contrivance is used, which carries the sugar and molasses between wharves and boats. The tropical fruit ships use an endless chain to which is attached at regular intervals pouches, into which bananas, etc., are placed, and carried from the

hold of the vessel to the wharf. As stated before, in most cases, spur tracks run from the main railroad tracks to the ship's side, to permit direct loading and unloading.

The City of New Orleans is now constructing a belt railroad system, which will encircle the entire city. It is already constructed along the river front for a distance of about eight miles, serving almost all the wharves along the left bank. It is owned entirely by the City of New Orleans, and will be controlled and operated by the city government. It is now in partial operation and will be in full operation within a year. When completed it will connect all the railroads, and will be a cheap and rapid method of transferring cars from one railroad system to another, and to the wharves.

Ownership of Docks or Wharves.—The ownership of wharves is vested in the State of Louisiana, and they are controlled and managed by the Board of Port Commissioners appointed by the Governor of the state. This board makes rates, subject, however, to the control of the legislature. Under legislative authority, the port commission prescribes all the rules and regulations for loading and unloading of vessels and for everything connected with the commerce of New Orleans, in so far as use of the wharves is concerned. The board is composed of five members, who are appointed for terms of five years each, in such a manner that not more than one commissioner's term of office expires each year. Previous to the appointment of this board, these wharves were leased to private individuals who used them as a source of private enrichment. The board uses the revenues solely in improvement of the wharves and extension of port facilities. The board is composed of prominent merchants and business men, and has given full satisfaction. The members receive no compensation, but, of course, their subordinates do. These subordinates perform their work well, and little or no complaint is ever heard against them.

Its employees comprise a superintendent and a secretary who receive each an annual salary of \$3,000; two engineers, receiving annual salaries of \$2,400 and \$1,600 respectively. In addition there are four deputy commissioners and one collector, a superintendent of construction, a bookkeeper and twelve other employees, inspectors, messengers and assistants. The total cost of administration is less than \$35,000 per annum. The board also maintains a patrol system of policemen, under the special control and pay of the board, at a cost of about \$22,000 per annum.

Nature of Charges for Services.—There is no charge whatever on the cargoes entering this port, but there are charges for wharfage which are levied on tonnage, and they are as follows: Ocean vessels, two cents per ton per day for the first three days, one cent per ton per day for the next three days, thereafter free for a period of thirty days. Where sheds are provided an additional charge of one and one-half cents per ton is made. All of the above charges are based upon the gross tonnage.

There are also charged harbor dues of \$2.50 for vessels under 100 tons, \$5.00 for vessels from 100 to 500 tons, and \$10.00 for vessels over 500 tons. A charge of \$1.00 is also made for each copy of certificate issued, for the inspection of hatches, surveys or cargoes, etc. The masters of each vessel

however, are furnished free one copy of all surveys upon their respective vessels or cargoes.

For river steamers, barges, luggers and other craft, using the wharves for not more than five days, a charge of six cents per ton is made, and for each day after said period of five days a charge of \$3.00 per day is made. Steamboats, etc., arriving and departing more than once a week are charged three cents per ton each trip. These charges are collected from the owners of the vessels, by the collectors of the port commissioners.

For the year ending August 31, 1906, the receipts from sea-going vessels were \$205,403.52 for wharfage, and for shed charges \$14,906.11, the total receipts from all sources during the year, ending August 31, 1906, were \$278,113.79. Balance on hand December 31, 1905, \$396,878.38. The disbursements were \$646,888.63; the greater part of these disbursements was for permanent improvements, such as sheds, wharves, etc., and to pay for real estate fronting on the river; the balance on hand in December, 1905 was principally composed of proceeds of the sale of bonds issued during the year before for the purpose of making improvements.

There is no income from rentals, leases, etc., all the income being from the sources just stated. All the funds received are used for the improvement and extension of harbor facilities, and for the redemption fund to retire the bonds, which were issued for the improvement of the wharves.

Suggestions for the Improvements of the Harbor.—The United States Government appropriates every year a considerable sum for keeping the harbor in condition. The Mississippi River is a peculiar stream; its banks are lined with levees which in the City of New Orleans rise several feet above the city proper, and the wharves are usually built on the river slope and extend over these levees. In the commercial part of the city, the levees are very wide and slope gradually so that the levee is hardly apparent to the view.

The changing current and eddies of the river, frequently after a high stage of water, make shoals of places where a week previous there were fifty feet of water. The port commissioners keep a dredge boat continually at work, taking away the silt and other deposits that accumulate. It also maintains a fire boat, whose services are given free of charge to any vessel or any dock on fire.

The port commission has been authorized to issue \$2,000,000 of bonds to build sheds, wharves, paved approaches, and other port improvements. It has issued so far but \$750,000 of these bonds, and has well under way a comprehensive system of sheds, approaches and wharf construction which will, within the next five years, make the harbor of New Orleans second to none in the country. What is now needed is for the United States Government to improve the river's mouth and banks so that there may be no obstruction there. Improvements now going on at South West Pass—the largest of the river's mouths—will soon give us another fine ocean outlet, through which the largest ships afloat can enter the Mississippi.

Altogether, the vast strides our local commerce is making, and the greater impulse that will be given by the construction of the Panama Canal, and the impetus already felt from the rapid increase of railroad terminal facilities

here, are doing wonders for New Orleans. The commercial and manufacturing interests have reason to congratulate themselves that the control and management of the harbor and port facilities that mean so much for local progress, are now taken out of politics and in control of practical and far-sighted commercial men, fully alive and equipped for the work they have undertaken.

DETROIT

By DELOS F. WILCOX, PH.D., Secretary Municipal League, Detroit, Mich.

The most notable characteristic of the water traffic at Detroit is the passenger service. This is the home port of regular and excursion steamers to Buffalo, Cleveland, Put-in-Bay, Toledo, the river islands, Chatham, St. Clair Flats, Port Huron, Alpena, St. Ignace and Mackinac. The number of excursion passengers carried is larger than from all the other lower lake ports combined.

The passenger steamers also carry large quantities of baggage and merchandise freight. As regards bulk freight, very little coal comes to this port by water; the iron ore receipts are not more than three or four million tons a year; a considerable portion of the lumber supply is brought by vessels owned by the dealers; the grain shipments eastward amount to eight or ten million bushels a year.

The harbor consists of about nine miles of water front on the Detroit River and four on the River Rouge. The dock line on Detroit River is nearly straight, with from twenty to forty feet depth of water. There are no mechanical devices furnished for unloading cargoes except in the case of coal and ore.

The city owns docks at the water works, public lighting plant, Owen Park, Belle Isle Bridge, and the Western Boulevard, although none of these except the first two are used very much as docks. The city also owns docks at the foot of three or four streets, but receives no rental from them. The rest of, and nearly all, the docks are private property.

The harbor master in Detroit is an officer appointed by the police department. No vessel may be unloaded at the public wharves without his permission. He is authorized to protect the owners and occupants of wharves and docks in the free use of them. He has authority to regulate the anchorage of vessels and to give directions relative to the location, change of station of steamboats or other vessels as the necessity of trade and navigation may demand, with due respect to the rights of occupants of wharves. In case any boat, vessel or wreck is sunk or deposited intentionally by its owner or the person in charge at any point in the Detroit River within the limits of the city so as to obstruct navigation, the harbor master must notify the owner or agent having control of the property to remove it, and if it is not removed to cause it to be taken away at the expense of the delinquent party.

WASHINGTON, D. C.

By DANIEL E. GARGES, Secretary, Committee on Wharves, District of Columbia.

The City of Washington is situated on the eastern bank of the Potomac River, 106 miles from its mouth and about 185 miles, via the river and Chesapeake Bay, from the Atlantic Ocean. The main branch of the river forms the southwestern boundary of the city, and it is joined from the east about three miles north of the southern apex of the District of Columbia by the eastern branch or Anacostia River, which flows through the District of Columbia in a southwesterly direction to that point. The river is navigable for vessels of comparatively light draught, but the channel is tortuous, the prevailing depth being about thirty feet.

There are about four miles of harbor frontage. The traffic consists of produce and small freight and also ice, wood, coal, lumber, etc. The amount of freight entering and leaving the port is about 878,823 tons per year.

The river in front of the city divides into the Washington channel, the Georgetown channel and the eastern branch. The wharf property along the Washington channel is owned by the United States and is under the control of the Commissioners of the District of Columbia. The wharves are leased to steamboat companies and commercial concerns, and the annual rental amounts to about \$16,000. The wharf property along the Georgetown channel is owned by private parties. The ownership of the wharf property along the eastern branch is an unsettled question. The Washington channel, where most of the shipping is done, has a Water Street front from 80 to 100 feet wide, which gives ample facilities for handling all shipping.

The matter of patrolling the harbor is under the police department and directly in charge of the harbor master, a lieutenant of the police force, whose duties are to see to the proper movement of vessels in the harbor and a general policing of the same. The matter of leasing the property is in charge of a committee on wharves, appointed by the Commissioners of the District of Columbia. All funds received from leases are deposited as revenues, one-half of which go to the District of Columbia, a municipal corporation, and the other half into the Treasury of the United States.

The water front of the City of Washington is in much need of improvement. The Congress of the United States, which makes all appropriations for the expenses of the government of the District of Columbia, has recognized this by providing an appropriation for the preparation of plans and a survey of the water front, with a view to its improvement. These plans are now in course of preparation, though no plan of treatment has yet been definitely decided upon. It is probable, however, that the entire water front owned by the United States will be reconstructed with concrete docks on piles; that the channel will be widened to admit of additional harbor and shipping facilities, and that the Water Street will be widened. The plans will possibly involve the expenditure of a million dollars. Among the features under consideration is a municipal dock with a recreation pier.

PROVIDENCE

By FRANK E. LAKEY, Providence, R. I.

The character of the shipping entering this port is chiefly coastwise. With the exception of an occasional two-master to the Cape Verde Islands, there is no transoceanic trade. Salt from Turks Island, and lumber from Nova Scotia, comprise the chief direct imports. For the year ending December 31, 1906, the harbor master reports 11,582 vessels as arriving, of which the steamers number 3,533; tugs, 3,221; barges, 1,535, and oyster boats, 2,915. The local excursion transportation is large and probably makes up the bulk of the 1,134,461 passengers carried last year by steamers. For some years two daily steamboats have left for New York. Recently two other boats have been added. A line runs to Norfolk, Va., also. The total merchandise for the year was 3,086,000 tons, of which that brought by steamers was 753,465 tons. The ten other chief items were: Coal, 2,133,772 (due to the extensive mills of Providence and vicinity, making over two-thirds of all merchandise received); oil, 43,209 tons (12,451,332 gallons); oysters and oyster shells, 43,081 tons; lumber, 31,531 tons (32,628,290 feet); iron, 8,166 tons; ice, 8,125 tons; brick, 8,012 tons; pipes, 6,574 tons; chemicals, 4,971 tons; salt, 4,140 tons; cement, 4,455. Thus the trade, exclusive of coal, is seen to be relatively small, despite the natural advantages of the bay and harbor.

The nature and extent of the harbor requires account to be taken of Narragansett Bay. This bay is 25.34 miles long, 7.39 miles middle width. Its tide-flowed area is 134.8 square miles, of which about 71.4 square miles are channels and possible anchorage grounds. Two main ship channels, with a third reaching part way to Providence, "have twenty-five feet at mean low water, and could be entered from the sea by the largest vessels without a pilot." With so secure a land-locked harbor, easy of access, with good railway facilities on both sides of the bay and in all directions, and immense and varied manufactured output, "Providence has peculiar advantages of location as an importing and exporting station, especially with reference to Atlantic coastwise traffic south of Cape Cod." The United States Government is at work enlarging the anchorage grounds to an area of 171 acres, with a depth of twenty-five feet at mean low water.

The condition of the water front at the present time is encouraging only in the possibilities of the future. Much can be done to develop and attract trade. Nature has been kind, but for the 300,000 or more persons within ten miles of the City Hall the amount of the marine transactions is not an object of boasting.

The facilities for handling cargoes are good, but crowded. Spur tracks run on the docks, reducing the handling to a minimum. The proposed system of docks on both sides of the harbor will have spur tracks on each dock. Easy connections north, west and south can be made with the main lines of railways without grade crossings.

The wharves of Providence are all private property and are used for specific purposes. Agitation from time to time for public wharves as yet

has borne no fruit. The management of the harbor is in the hands of three harbor commissioners, elected by the legislature, and a harbor master, elected by the city council. The excellence of the service of the chairman of the commission is attested by his incumbency for thirty consecutive years—since its organization, in 1877. The income from rentals, leases, etc., cannot be ascertained, since it is purely a private matter.

The future improvement of the harbor and bay presents brilliant prospects. By act of the legislature \$400,000 has been voted. This has never been appropriated. The state is to be asked to submit a proposition to the voters to issue \$500,000 state bonds for harbor improvement. By act of Congress, passed in 1906, \$750,000 was appropriated for Narragansett Bay and Point Judith Breakwater. Of this amount \$500,000 is to be spent above Providence Island, *i. e.*, anchorage for Providence, to make an anchorage twenty-five feet deep at mean low water and 400 feet wide, with two wide channels direct to the sea. Thus \$1,650,000 will, in all probability, be soon available for the harbor and bay. The channel of the Seekouk River has been straightened and deepened, rendering easier access to the City of Pawtucket. When the railroad bridge over this river (which lies directly east of Providence) is completed, other changes are planned which will add greatly to the usefulness of this river.

The Harbor Improvement Commission, composed of some of the ablest men in the state, and appointed by the legislature, in their report for 1906 say, "Experience and the process of reasoning both seem to indicate that the welfare of the public requires the public ownership and control of at least a part of the shore, with wharves, slips and terminal facilities thereon." It is suggested that the state improve one or two wharves at a time and lease for fifteen-year terms. "Thirty per cent of the water front could be thus held and controlled for the public use and benefit." A fifty-year three per cent harbor improvement bond could be placed, and, in the opinion of the commission, not only would no burden result, but the amount needed to be raised by general taxes would be lessened. If the proposed canal connecting Narragansett Bay and Boston harbor were built, the necessity for the improvement of the harbor would be increased. In twenty-six years the route around Cape Cod has claimed 1,233 wrecks, at an average yearly property loss of over \$500,000, and a yearly sacrifice of thirty lives.

WILMINGTON

By WILLIAM COYNE and JOHN N. LAWSON, JR., Wilmington, Del.

Wilmington is the headquarters of the largest powder and explosive manufacturing company, has the largest car wheel manufacturing plant, the largest patent leather plant, and two of the largest morocco leather plants in the world. Last year its commerce by water amounted to \$72,000,000. and by rail to \$120,000,000, a total of \$192,000,000, or \$2,230 per capita, which indicates its commercial importance and its need of water and rail facilities.

Wilmington has three rivers, the Brandywine, Christiana and Delaware. The Delaware flows along its eastern border three miles. The Christiana, which flows through the manufacturing district, entering the Delaware midway between the northern and southern borders of the city, has a channel 18 by 150 feet at low water for three miles from its mouth. The Brandywine flows into the Christiana three-quarters of a mile from its mouth and has a channel 7 by 60 feet at low water for one and a half miles.

The national government is bulkheading the Delaware one and a half miles along the eastern city line. When completed, there will be seventeen feet of water at low tide along the bulkhead, gradually deepening to the main channel, which is 400 feet from the bulkheading. The national government is now dredging the Delaware main channel to make a 30 by 600 feet channel at low water from the sea to Philadelphia, it being to-day less than twenty-eight feet deep at low water.

The theory of the United States engineers is that bulkheading at Wilmington will so narrow and increase the current that the 30 by 600 feet channel will be maintained without future dredging. This will tend to deepen the water between the bulkheading and the main channel, but if it does not, little dredging will be required to enable the deepest draft vessels to lie alongside the bulkheading. Material taken from the channel is being used to fill behind the bulkheading, thus, without any expense to the city, providing a wharfage front of one and a half miles on deepwater. The water front is easily accessible to any of the three railway systems that serve the city, the Pennsylvania, Baltimore and Ohio, and Philadelphia and Reading (all are close to the water front), or to any other interests seeking a safe, commodious ocean port.

If the government does not extend the bulkheading further down the river, private or municipal enterprise can, with but little outlay, provide the additional bulkheading required to make the entire three miles of Delaware River frontage one long deep water wharf.

Wilmington is within seventy-two miles of the sea, and there would seem no good reason why, with an immediately prospective deep water frontage of one and one half miles, and Christiana River frontage of six miles of eighteen feet depth at low water, it should not provide adequate rail and water facilities for a manufacturing community of a million people in the near future.

At present the shipping, entering or leaving the port, is confined to passenger and freight lines running between Wilmington and Philadelphia, Wilmington and New Jersey coast points, a freight line between Wilmington and New York, and numerous coastwise vessels of all descriptions, engaged in transporting raw materials to and finished products from its numerous industries. Ocean steamers of deep draft are discharged or loaded in the Delaware River by the use of car-floats or lighters. Thirty to forty such vessels are discharged and an equal number loaded annually. The Philadelphia and Reading Railway maintains a car-float system, serving numerous industries up and down the Delaware from Wilmington. All cargoes are handled to and from vessels by hand or winches.

The city owns eight docks, averaging fifty feet in length, along the Christiana on the eighteen foot channel, which it leases for an annual rental of \$100 per dock. The lessees use the docks for their private business. Leases are for three-year periods. Nearly all lessees will, for a nominal charge, allow goods to be handled over their docks, so long as it does not interfere with their business. Along the eighteen foot channel of the Christiana River front 15,000 feet are owned and used by industries that have more or less dockage facilities. Practically 20,000 feet of the Christiana River frontage toward its mouth is unoccupied. The present plan is to narrow the Christiana channel by building wharves or piers, and thus increase the current so that little or no dredging will ever be required.

The proposed deep water canal between Delaware River and Chesapeake Bay will be of almost immeasurable importance to the shipping and commercial interests of Pennsylvania, New Jersey, Delaware, Maryland, Virginia, North and South Carolina. Wilmington will reap its proportional benefit.

Wilmington waters are under the control of a board of port wardens, elected by the city councils annually; they, in turn, appoint a harbor master, whose duties are to see that nothing is done to disturb the channels or commerce, to regulate speeds and to settle differences. The duties of all are well performed.

There seems to be splendid opportunity for the municipality of Wilmington to acquire all the frontage along the Christiana and Delaware Rivers not occupied, improving it by erecting wharves, piers and docking facilities as necessity therefor arises, and leasing them at low rates to either private or public enterprises. So situated, the city would be able not only to recoup itself on the investment and provide a continued source of revenue, but would have the immense advantage of being able to offer inducements to large manufacturing or transportation interests, to whom deep water transportation, added to adequate railroad facilities, is of paramount importance. The rail and water facilities of the larger coast cities of the United States are to-day abnormally congested. This congestion is growing daily. The present seems, therefore, a most opportune time for cities situated like Wilmington to condemn and acquire, at a reasonable figure, wharfage property that will, with improvement, be of immeasurable value.

DULUTH

By ALFRED MCCALLUM, Duluth, Minn.

During the "Glacial Period" Lake Superior was fully 500 feet higher than it is at present. The action of the waves, at that time, brought about that peculiar formation known as Minnesota Point, which forms a natural breakwater for the bays of Superior, St. Louis and Allouez, which are the Duluth-Superior harbor. This strip of land is fully nine miles in length, extending from Duluth to the Wisconsin shore. It is cut by two canals a trifle over six miles apart, known as the Duluth Ship Canal and the Superior

Entry. The Duluth Ship Canal was originally built by the City of Duluth in 1871; was rebuilt and enlarged by the United States Government in 1898-1901 at a cost of \$650,000. The Superior Entry was originally the outlet of the St. Louis River and was a winding channel over a shifting sandbar, with an available depth of nine to eleven feet and difficult to follow. This canal was originally constructed with timber piers at the site of the natural entrance in 1867-1875. Reconstruction with concrete piers commenced in 1903 and is now in progress. The estimated cost of reconstruction is over \$1,000,000. Through these two arteries of commerce passed last year (1906) a tonnage of 29,171,221 short tons, valued at \$251,894,844, being an increase over the previous year of 28.64 per cent, and an increase over the year 1890 of 924 per cent. This enormous tonnage would provide 3,000 cargoes for the largest freighter on the lakes, and would furnish loads for all the cars that could be gotten on a three-track railway extending from New York to San Francisco, with cars of a capacity of 40,000 pounds.

Major Graham D. Fitch, in charge of harbor improvements on Lake Superior, in his annual report, just completed, says: "It is impossible to give precise figures of the marine commerce of the principal ports of the United States for comparison with the Duluth-Superior harbor, for the reason that at ocean ports of the United States, as well as of foreign countries, no record of domestic tonnage is kept at the custom houses, whereas, on the Great Lakes, a record is kept of the total marine commerce, both foreign and domestic. In the principal ocean ports of the United States the tonnage of the local and coastwise (domestic) marine commerce is several times greater than that of the foreign."

Any comparison, therefore, of the relative marine commerce of lake and ocean ports, based solely on custom house records, is, for the reason stated, incorrect and misleading.

The navigation season for the Duluth-Superior harbor averages only about eight months per annum, while for ocean ports navigation is carried on during twelve months. Considering the mean monthly freight movement during the season of navigation, Duluth-Superior harbor practically stands next to New York.

The strategic position of Duluth in the world of commerce is due to this magnificent landlocked harbor, stretching away from the ship canal a distance of five miles to West Duluth for the larger vessels and then on to New Duluth, through the St. Louis River, for vessels of lighter draft.

Before being improved the harbor was a broad expanse of shallow water, with a general depth of only eight or nine feet, except along the channels, which were deeper, but variable. A great deal of money has been expended on these channels by the government. By an act of Congress in 1896 contracts were let for the removal of 21,000,000 yards of earth at an estimated cost of \$3,130,553, this being the largest dredging contract ever let in the United States. The operations just described have given fully seventeen miles of dredged channels from 120 to 600 feet wide and basins of an aggregate area of about 360 acres. The general depth is twenty-two feet, and no part of the dredged area has a less depth than twenty feet at low water. This work

gave us a harbor frontage of forty-nine miles, lined with docks equipped for the loading and unloading of almost every kind of merchandise. Every year millions of feet of logs are rafted through the canals to be sawed into lumber at the local mills and then loaded on vessels for transportation to lower lake ports. There are numerous coal docks equipped with the most modern machinery for the speedy and economical unloading of vessels, the coal to be again loaded on cars for distribution to the great Northwest. The railroad docks are equipped for the handling of package freight, and grain with which the elevators are full to bursting at this season of the year from the farms of Minnesota, the Dakotas and even from the Canadian Alberta country. Last and greatest come the iron ore docks, from which was loaded last year 19,368,186 tons, with a valuation of \$48,420,464. This mineral makes up about two-thirds of the total tonnage of the Duluth-Superior harbor.

The city's interest in the harbor is looked after by a harbor master, who performs his duties in a satisfactory manner. He has to decide between vessels their right to a certain dock, to prevent the obstruction of slips by vessels laying at the head of a dock, to prevent dumping ashes in the bay, and to take care of the city's interest in the harbor generally.

The municipal docks, of which there are several, are built at the end of streets or avenues, and are used principally for ferry purposes. They are kept up by the city, and no revenue is collected for their use.

The water of the St. Louis River is diverted at Thompson by the Great Northern Power Company, who have developed 30,000 electrical horse-power under a fall of 378 feet. This has been brought to Duluth and is now almost ready for distribution. The company expect ultimately to develop and install an additional 110,000 horse-power to operate under a fall of 740 feet. What this will eventually mean to the financial, commercial and shipping interests of Duluth can more readily be understood when it is known that less than 20,000 horse-power is used at the head of the lakes to-day.

The widening of the entry of the Duluth Ship Canal allows the waves a greater sweep into Superior Bay, and as a result, when a northeast wind is blowing, which is the prevailing wind at certain seasons of the year, boats find it next to impossible to lie at their docks. One boat last year broke fifteen six and one-half inch lines while unloading her cargo. This condition has made a problem which the government engineers are attempting to solve. Several schemes have been proposed, but the one that seems to meet with the greatest favor here is that of constructing a breakwater about a mile from the canal to extend from the land a sufficient distance out into the lake to protect the entrance to the harbor.

No description of the harbor would be complete without some mention of the Aerial Bridge, which spans the Duluth Ship Canal at Lake Avenue, and is the only one of its kind in the world. Before the bridge was built transportation was done by ferry, which was inadequate and expensive. Many different kinds of bridges were suggested to the government engineers, but none met with their approval, as they were likely to interfere with navigation. After receiving suggestions from others, Thomas F. McGilvray,

city engineer, finally evolved the present plan, which was accepted by the government engineers.

The opening between towers, which signifies practically the length of the bridge, is 394 feet. The lower truss of the bridge is 135 feet from the water and the upper chord is 185 feet above water level. Its actual weight is 3,337,000 pounds, and it cost \$108,000. The car will hold 400 people and four teams and is operated by means of a trolley wire and a cable, which is wound around a steel drum, the controllers and motors being aboard of the car.

The cheapness of freight rates by water gives Duluth the key to the situation as a distributing point, and will eventually build up here the largest wholesale center for that great empire of the Northwest.

TAMPA

By J. D. CALHOUN, Secretary of Board of Trade, Tampa, Fla.

There are four ports located on Tampa Bay—Port Tampa, Tampa, St. Petersburg and the Manatee River—naming them in the order of their present dimensions, business and activity. For all practical purposes only the two first named need consideration here. Port Tampa is located on Old Tampa Bay, nine miles southward from the city. The port of the city itself is located on the upper end of Hillsborough Bay and along the Hillsborough River for perhaps four thousand feet above the mouth. This port is undergoing enlargement and development to a depth of twenty feet in its channel and slips, with the erection of a complete system of commercial terminal facilities—a work which will be practically completed within a year.

Both these harbors are completely landlocked and sheltered from wind and wave, and are situated inland respectively twenty-nine and thirty-eight miles from the Gulf. The facilities of Port Tampa are complete in every essential respect, and vessels drawing twenty-four feet of water may anchor in the slips. The water front is in the best and most improved condition, and the facilities for handling cargoes are sufficient and modern. This same description will apply to the immediate harbor of Tampa within a year—with the exception that the channel depth will be but twenty feet.

The number of seagoing vessels arriving and departing from Port Tampa during the year 1906 was 903, with merchandise tonnage of 968,951 tons, of which 529,268 was phosphate for export.

The commerce of Hillsborough Bay, being more largely local, was carried on by smaller vessels and marked by much greater activity. The number of arrivals and departures was 2,147 and 2,143, respectively, and the actual tonnage of merchandise conveyed was 432,981.

The ownership of docks and wharves is private in both ports—the Atlantic Coast Line Railway, by a subsidiary company, owning the facilities at Port Tampa, and the Seaboard Air Line Railway being engaged in the

work of enlargement and construction at Tampa. At Tampa there are many commercial houses owning their own frontage and facilities for shipping, these facilities being necessarily somewhat crude.

The maintenance of condition is a matter attended to by the owners, except that the government maintains the condition of the various channels which it constructed. This is almost a negligible item, on account of its smallness.

The harbor officers consist of a harbor master and six pilots, with a practically nominal commission for the selection of the master and pilots—the harbor master, however, being actually designated by the governor of the state. He has no specific salary, but it is understood that he receives compensation from the pilots' association. The duties of the harbor master are very slight. The pilots are efficient. Their charges are collected from the vessels employing their services, and such service is compulsory with few exceptions. Charges for towage are a matter of private arrangement between the tugs and the vessels employing them.

The wharf business being entirely private—except as the Atlantic Coast Line is required to publish a schedule of charges—there is no way of ascertaining the sum of the moneys received from charges, rentals, etc., or the disposition of the same.

As regards the improvement of the harbors and bettering the facilities for commerce, the situation is such that there is nothing needed which does not promise soon to be supplied. With the increase of traffic that will be developed by the deeper channel and early improvements at Tampa there will doubtless be a demand for an increased depth of the channel. A need common to the entire bay is a depth of thirty feet, with a width of 300 feet over the outer bar at Egmont Pass, and a gradual deepening of all inside channels and slips to a like depth as the requirements of commerce demand.

FOREIGN CITIES.

LONDON, ENGLAND

By PROF. J. RUSSELL SMITH, University of Pennsylvania

Almost every city in the whole world having any great commercial importance has a port problem demanding that something shall be done for the improvement of existing conditions. It has come about through the territorial division of labor which has caused the bulk of foreign commerce to increase tremendously and continuously in every quarter of the globe. Along with this growth of trade has been a growth in the size of the ships, commanding not only more space, but also, what is of even greater cost, more depth.

Great Britain, being the leader in nineteenth century commerce, had the port problem to meet and settle earlier than other countries, and it met the situation in the first half of the nineteenth century by private enterprise.

Scores of dock companies were formed to improve the various ports, sometimes several of them in one port. These were private corporations seeking profits, just as a railway or any other transportation company does. Unfortunately for these investors, the conditions did not favor the permanent success of their enterprise; for a few decades all went well, and then the mid-century spurt of British commerce caused them to become inadequate. The introduction of the steamer also made many of the docks out of date, because a large new vessel could not enter the old dock. The increase in trade and increase of steamer size caused a general breakdown of the old private dock companies, and some kind of a port reorganization problem faced most of the British cities in the decade 1850-1860.

The problem was a much more difficult one than it would have been in America, because of the physical peculiarities of the British streams and harbors. The coast of that country is swept by a tide of such great height that, while a modern vessel can enter almost any river at high tide, at low tide, owing to the great fall of water, the vessel lies in the harbor subject to strains which modern shipping cannot resist. Some artificial body of water must, therefore, be prepared in which the vessel can lie in safety at low tide. This difficulty was met by the building of so-called wet docks, which are almost invariable excavations in the lowlands along the bank of the river, which excavations must be walled up and can be entered only through lock gates such as are used in ship canals.

It is interesting to note that one British port did not demand reorganization in the decade 1850-60. This was London, where the old private companies were able to improve their facilities and meet the demands which had wrecked scores of similar companies in other British ports. The greater strength of the London companies was due to the fact that the vast commerce of London had enabled them to become strong, and the very high value of the commerce of the city, which was the European distributing point for the valuable commerce of the East, enabled the companies to lay heavier dues than could be borne by the bulkier and less valuable commerce of other cities. But the end of the London private companies is near at hand. The commercial interests of the city and of the empire are united in the demand for more facilities; the existing authorities are alike united in their inability to meet them. Something must be done to improve the port of the greatest city in the world, which is now being sapped because of her inadequate facilities for the receipt of ships.

The present deadlock furnishes an interesting example of the way the British have in the past managed their harbors. There are no less than four private interests doing work which, in Germany, and to a considerable extent in America, would be done by an arm of government.

(1) The first of these is Trinity House, an old corporation grown from a mediæval guild of pilots, located on the Lower Thames. It has gradually changed its character through the centuries, and now has, in addition to the authority over pilots, the work of lighting and buoying the channel of the Thames, and is also the lighthouse authority for the coast of England, Wales and Gibraltar. While it has absolute power over the pilots and

lights of the river that reach to London, it is a close corporation in which the senior members, the "Elder Brethren," fill their own vacancies from the junior or "Younger Brethren," and also elect outsiders to fill this lower branch of their membership.

(2) There is considerable danger of confusion and trouble because of the lack of co-operation between the activities of the Trinity House and the Thames Conservancy Board, which is the channel deepening body of the River Thames. This board is the creation of Parliament and represents the one important step taken in the 50's (1857) to enable London to meet the increased demands of free trade commerce. This body has charge of deepening the channel, regulates vessels within the port, licenses docks and piers, and makes any needed by-laws for the control of shipping in the harbor.

Its revenues come from the dues paid by vessels passing up and down the Thames, but its funds are entirely inadequate for the great improvements that are needed in the harbor.

(3) If the channel could be deepened so that the greatest ship could come to London, there is no dock in which she could lie. The old companies which prospered from 1800 to 1880 have done their best and can do no more. Under the régime of competition they had, in the latter part of the last century, severe rate wars and also made great financial sacrifices to build new and improved docks. Through consolidations there came to be but two strong companies in 1880. In 1888 these two companies came to a working understanding and stopped competing with each other; they were finally consolidated into one management in 1900, but all to no avail. Their dividends have ceased, their financial condition is hopeless and Parliament will not permit them to charge heavier dues, and if they could the commerce would probably not stand it. If they could get the greatest ship in the world to reach their gates, the dock companies could not make a berth for it, and they are inadequate for those that now enter. There is great confusion in the delivery of the goods. Two and even three cargoes sometimes lie upon the quays and wait for the lighters to come carry them away.

(4) The fourth individual factor in London is the Watermen's Company, which has the control over all the boats in the harbor. Nearly all the goods coming into the port are handled at least once in a lighter. These, with the river boats, make a total of over 12,000 craft, and these craft can be run only by a man licensed by the Watermen's Company. This company is the present form of a sixteenth century guild of Queen Elizabeth's time that then had a monopoly of running rowboats within the city limits on the River Thames. It was necessary for such a man to be a good oarsman, and he therefore became a member of the guild only through membership, and to this day the man who runs a scow or steamer on the River Thames must have passed his apprenticeship in the Watermen's Company.

Of these four individual powers the three whose functions require the spending of money are bankrupt, and the fourth has arbitrary power which is rather easy in the present day of trade unionism to abuse. A royal commission has investigated this matter for two years, and has recommended

to Parliament the creation of a public trust. This characteristic of British institutions would combine the functions of all bodies now having any authority over the port of London. It would eliminate private profit and, through the disappearance of the hope of dividends, it could lessen its expenses by borrowing money upon the security of the port. The proposed composition of the board shows the compromise element in British institutions. The members are to be appointed as follows:

	<i>Members.</i>
(a) By the London County Council	11
(b) By the City Corporation	3
(c) By the Admiralty	1
(d) By the Board of Trade	1
(e) By the Trinity House	1
(f) By the Kent County Council	1
(g) By the Essex County Council	1
(h) By the London Chamber of Commerce	2
(i) By the Governors of the Bank England, from among persons belonging to the mercantile community of London.	5

The elected members should be elected by different groups of voters, viz.:

	<i>Members.</i>
(j) By the oversea (or ocean) trading shipowners	5
(k) By the short sea-trading shipowners	2
(l) By the wharfingers and owners of private warehouses on the river	3
(m) By owners of lighters, barges and river craft, including river passenger steamers	2
(n) By railway companies connecting with the docks	2

"The electing persons, firms or companies should be given a number of votes, varying according to the amounts paid in dues upon goods, or upon shipping, as the case may be."

This is much like the manner of conducting the harbors of Liverpool and Glasgow, where such public trusts have done a great work and given much satisfaction. This is partly due, doubtless, to the character of the men who sit upon the boards of control. It is an honor to be elected; they serve without pay, as do the trustees of American universities. Unfortunately for London, the interests within the port are not all satisfied with the proposed public trust arrangement and the bill has been defeated. Parliament and London still waits and wrestles with her problem which *must* be solved.

MANCHESTER, ENGLAND

By ERNEST SMITH BRADFORD, University of Pennsylvania

Manchester presents the case of the operation of a ship canal as well as docks.

As will be recalled, the city lies inland, thirty-five miles from Liverpool, on a branch of the Mersey River, the center of "the greatest cotton manufacturing area in the world." The population of the city itself in 1905 was 631,185, but it serves a vastly larger section as collecting and distributing point. The agitation to connect the city by canal with deep water, and thus free the city from the necessity of conducting all its export and import trade through Liverpool, where dock charges were increased by the cost of railway haulage to Manchester, began in 1882. A company was formed to carry out the enterprise; but after spending nearly all of its capital, \$50,000,000, found itself unable to proceed further. The City of Manchester came forward with a loan of \$25,000,000, and the work was finished, the canal and docks being opened for traffic January 1, 1894. The canal is thirty-five miles long and has four locks, as the Manchester wharves are sixty feet above sea level. Seagoing vessels drawing twenty-six feet can dock in the heart of the city, and the depth is being increased to twenty-eight feet.

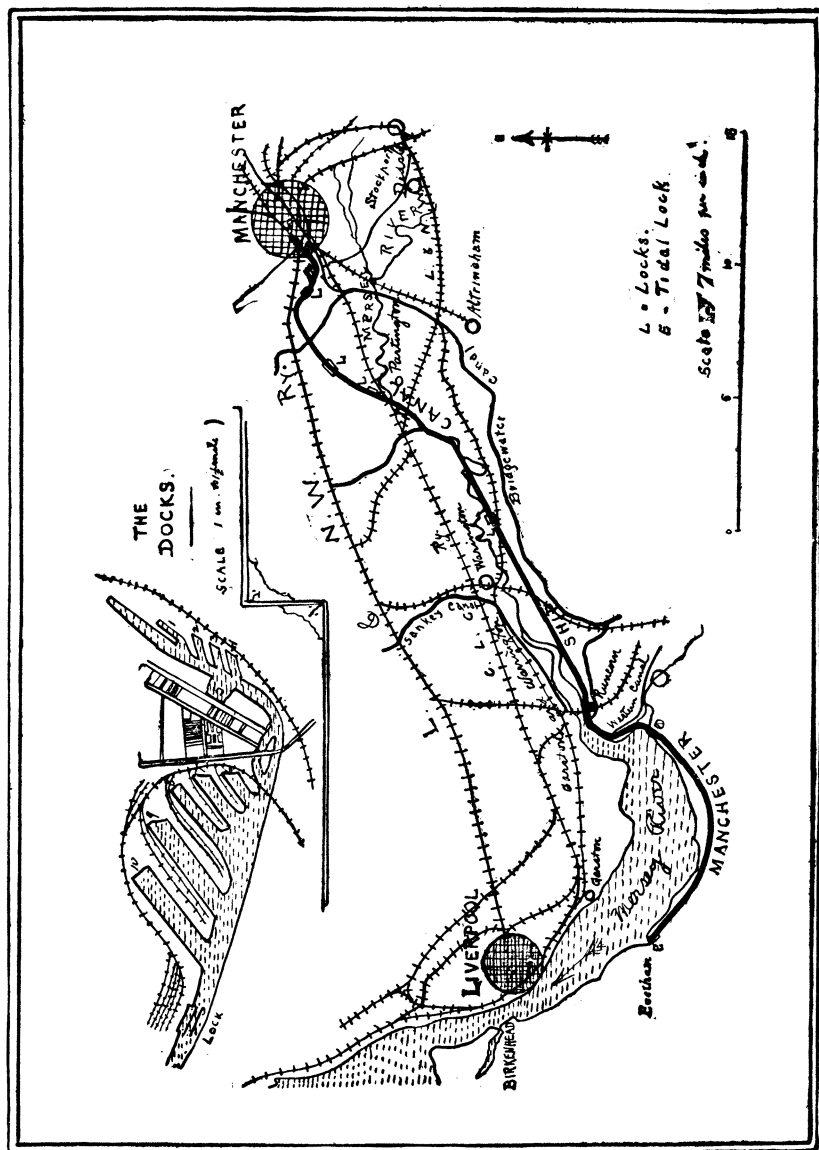
In return for the loan the city obtained control of the Manchester Ship Canal Company, electing eleven out of twenty-one directors, so that, although it is a mixed municipal and company enterprise as regards investment, its management is municipal. The taxpayers were assessed in 1897-8, to maintain the canal, a rate of 1 shilling 18-10 pence in the pound, a rate reduced in 1906, with the increasing business of the canal, to 4½ pence in the pound.

Below the board of directors, who have general control of the works, with their secretary and accountant, auditors, and firm of solicitors and bankers, the administration is divided between the ship canal department proper and the Bridgewater department, which operates the old Bridgewater Canal.

At the head of the ship canal department is a general superintendent, associated with whom is a chief traffic superintendent, an indoor superintendent and a railway traffic indoor superintendent. These are in the main dock office. For the docks there are a dock traffic superintendent, a railway superintendent, stores superintendent and police superintendent. There are, besides, a grain elevator superintendent, a coal superintendent (at Partington), a dockmaster and canal superintendent; and three district canal superintendents at Eastham, Latchford and Irlam. There are also chief and consulting engineers and assistants, land agents, an advertising agent, and representatives in Liverpool, London, Toronto and New York.

The Bridgewater department has a somewhat similar, though less extended, organization.

Under the control of these authorities are six miles of docks, with large warehouses; forty miles of railroad on the wharves and sixty-five more along the canal at various points—105 miles in all (1903) worked by the ship



canal company, with freight cars and locomotives, tugs to assist steamers up and down the canal, locks and sluices, swing bridges and ferries, dredges and barges. Besides the cattle pens provided by the canal company for the coast-wise cattle trade, the City of Manchester directly has erected other needed cattle yards at the wharves, and owns a cold storage plant one and a half miles from the docks. The docks are lighted by electricity, goods being discharged and loaded frequently at night. The pilotage service is in the hands of a pilotage board, which examines and licenses pilots, though pilotage on the canal is not compulsory. The board consists of six members, elected by the canal company, and three pilots. There are about 1,200 permanent employees in the ship canal department, not including laborers by the day or by piece-work, and in the Bridgewater department, 2,500—3,700 in all.

At the beginning sweeping reductions in rates, both ways, were made by the ship canal, and competition forced the railways between Manchester and Liverpool to reduce their rates, also. At the same time, traffic increased both on canal and railways, consequent on the larger volume of business due to lower freights. The amount of sea-borne traffic passing through the locks in 1899 was 2,788,108 freight tons; in 1902, 3,137,348 tons; in 1904, 3,917,528 tons; while in the first half only of 1906, 2,112,000 tons, but the increased cost of handling was small in comparison. The expenses fell from 91 per cent of the receipts in 1897 to 60½ per cent in 1902. The financial results, so disappointing in the earlier years, have been much better since 1900. Along with larger cotton imports and exports have gone other items; wheat imports have increased from 4,356,000 bushels in 1901 to 8,741,600 bushels in 1904, "all of which trade," says United States Consul Hamm, of Hull, "has been captured from other ports, notably Hull and Liverpool." The canal has more than paid operating expenses since 1896; the interest on the city's stock, £5,000,000, has been met by taxes, the continual decrease of which has already been referred to, and which are likely to be soon entirely done away with, if the increase in receipts continues to exceed the increase in expenses. The private stockholders have had little return on their investment, however. The arrears of interest owing by the canal company January 1, 1905, amounted to nearly \$9,000,000, of which \$4,450,000 has been cancelled, and for the balance 3½ per cent preferred stock issued. From the standpoint of the shareholders in the company, the enterprise has not yet succeeded; from that of shipping interests and the general economic welfare of the city, it has been an undoubted success. Opinion as to the result of Manchester's experiment depends on the answer to the question whether city port facilities should be administered as a profit-making industry, such as city water works and lighting plants, or as the non-revenue producing factors, such as parks, sewers, streets and bridges.

HAMBURG AND BREMEN, GERMANY

By S. S. HUEBNER, Ph.D., University of Pennsylvania

Although the Imperial Government of Germany exercises a large measure of control over the merchant marine and over navigation on interstate waterways, it possesses, broadly speaking, no authority to construct or manage harbors, this function being intrusted solely to the care of the several states.

In Hamburg and Bremen the harbors are operated as state property, the work of construction being placed in the hands of a special department for this purpose and the general supervision and care of the harbor being exercised in Hamburg by a Department of Trade and Commerce and in Bremen by a Department for Harbors and Railways. Over these departments stands the Senate of the state, which exercises the ultimate executive power. All expenditures for purposes of construction and operation are borne by the two city-republics themselves, and are defrayed from general taxation. The receipts, on the other hand, are merged with the general income of the state, there being no necessary connection between the expenditures for harbors and the receipts derived therefrom.

In the case of each of these world-ports, the state either owns or controls the larger portion of the warehouse system. Bremen, for example, in return for a stipulated percentage of the net earnings, furnishes the ground and constructs the buildings, but does not interfere with the management of business activity of the system, except as regards the regulation of the warehouse dues. Hamburg, on the other hand, does not in the main assume the duty of constructing the buildings, but merely leases the ground for a certain percentage of the net earnings to a Free Harbor Warehouse Association. This association, while obliged to construct all necessary buildings and bear all financial losses, is, nevertheless, subject to a large measure of state control. To the Senate belongs the right of regulating the warehouse dues and of determining the nature of the buildings to be constructed. Likewise all acts which involve an increase in the capital stock or indebtedness of the association, or a change in its rules must be sanctioned by the Senate. Finally, the state is represented in the directorate of the association and possesses the power to suspend any act of that body until the Senate may have passed on its expediency.

What has been said concerning Hamburg and Bremen holds in a general way for the other German harbors. As a rule, their construction and management are intrusted to the care of local boards or commissions subject to the general supervision of the state; in Lubeck to a Board of Public Works and the police authority, in Rostock to a Board of Public Works, and in Wismar to a Harbor Department. In Prussia the management and improvement of harbors is conducted either under the supervision of the Board of Public Works for each respective city or by permanent commissions, which are local in character, but which must receive the sanction of the state as regards harbor improvements and other important changes. To be specific, all harbor matters in Stettin are managed by a Board of Public Works; in Kiel, by a Harbor Commission; in Flensburg by a Harbor and Bridge Commission, in Swinemuende, by a Royal Commission of Navigation

officiating as a local authority; and in Koenigsberg by a Royal Harbor Police Commission. The operating expenses, as a rule, are borne by the local communities and are defrayed from the harbor receipts.

Improvement of Harbor Channels.—During the last twenty-five years nearly all the leading seaports of Northwest Europe have exerted themselves to the utmost in an endeavor to adapt their facilities to the growing conditions of international trade. Indeed, practically all the leading ports, with the exception of London, have remained close rivals in this respect during the whole of this period. This strenuous competition may be attributed, first, to the rapidly increasing size and draught of ocean steamers, and, secondly, to the struggle between these ports for the Eastern trade and the consequent desire to accommodate ships of the Suez standard. The less anyone of these harbors is dependent upon the influence of tide, the greater is the advantage of that port. Hence any effort on the part of one harbor to deepen its channel or to improve its facilities for landing, loading and unloading, has resulted in a corresponding effort on the part of the other ports.

As regards the channel leading from the sea to the landing place, the German ports cannot be said to have been favored by nature. Whatever position these harbors now hold has been the result of vast labor and expenditure and the improvements have by no means been completed. Hamburg, until about 1850, possessed a channel measuring only from 4.0 to 4.3 meters in depth at high tide. At an enormous expenditure this depth has been increased to 8.3 meters, while arrangements have been made for a further increase of 1.7 meters. Bremen has also labored under unusual difficulties since its original channel measured only 2.5 meters in depth. After an outlay of some 50,000,000 marks, however, this city has secured a channel which can accommodate ocean-going vessels with a draught of six meters.

Improvement of Harbor Facilities.—The rivalry between the leading ports of Europe concerning the improvement of their channels also exists in the provision of basins, wharves, warehouses and other necessary equipment. Enormous sums have been paid by most of the ports in rendering easier and swifter the process of loading and unloading. Particularly is this true of Hamburg, nearly all of whose harbor facilities have been constructed during the last twenty years. Even as late as 1866 all sea-going vessels were obliged to anchor in the open stream, and the whole process of loading and unloading had to be conducted by means of lighters. About this time, Hamburg began the construction of a series of improvements with the result that to-day her system of docks and piers is reputed to be the best in existence, and her ship lines, according to Dr. Wiedenfeld, enjoy an ease of communication with the shore far superior to that furnished by the English ports.

Besides possessing probably the best system of warehouses in the world, Hamburg has made admirable connection with the railways and interior waterways. Separate harbor basins have been constructed for the numerous canal and river boats where they may remain to await the arrival of steamers. The steamer basins have been constructed with a view to making a swift transfer of freight to and from vessels the prime consideration, any gain

in this respect meaning of course a corresponding gain in the length of available piers. The wharves, besides being exceedingly spacious and built of durable material, are amply supplied with hydraulic machinery. At the present time the basins cover an area of 336.4 acres, while the total length of quays approximates 8.5 miles. Extensions are now being made, however, which will increase the area of the basins to 612.56 acres and the length of the quays to twelve miles. When this project is completed Hamburg will have spent some 180,000,000 marks since 1880 for its harbor facilities—of which sum the Imperial Government contributed 40,000,000 marks at the time of Hamburg's accession to the Customs Union—and this enormous outlay does not include the large sums expended in deepening and otherwise improving the channel, or in constructing the excellent system of warehouses. It only requires the further deepening of the channel, for which arrangements have already been made, and the completion of the extensions referred to above, to make Hamburg's harbor satisfy the highest requirements of modern efficiency.

What has been said of Hamburg is true of Bremen and the Dutch-Belgian ports, though on a smaller scale. In the provision of appliances for loading and unloading freight these harbors are practically on a par, and meet the latest requirements. In all, too, the construction of the harbor was so arranged that the new warehouses would be situated at once near the water and in the immediate vicinity of the large mercantile offices.

Limiting our discussion to the sums expended, it appears that subsequent to 1885 Bremen was paid in round numbers 93,800,000 marks for its harbor facilities, exclusive of the 50,000,000 marks devoted to the deepening of the channel. Of this sum the Imperial Government contributed 12,000,000 marks when Bremen joined the Customs Union in 1888 and 1,800,000 marks towards the construction of the Kaiserdock at Bremerhafen. Large sums have also been expended in Stettin, Danzig, Kiel, Emden and other smaller ports on the North Sea. Stettin, after an outlay of some 40,000,000 marks, has secured a harbor which is not only beginning to share in the American trade, but which, at the expense of Copenhagen and Gothenburg, is rapidly acquiring more and more of the Russian and Scandinavian trade. Altogether, it has been estimated that the several governments of Germany have devoted about \$125,000,000 since 1888 towards the improvement of harbors, and that of this sum about six-tenths has been used for the channel and other facilities of Hamburg alone. This single port, it has been said, "has spent more money than any other two harbors in the world together during the last score of years to perfect its technical facilities."

BARCELONA, SPAIN

By CHESTER LLOYD JONES, University of Pennsylvania

The rapid rise of Barcelona to commercial and industrial importance is the pride of every Spaniard who hopes for a brilliant future for his country. Nor is the satisfaction in the growth of the city unsupported by facts for few, if any, of the cities of south Europe can show such a

remarkable rejuvenation as has taken place in the Spanish metropolis in the latter half of the nineteenth century.

The transformation of Barcelona from a fairly prosperous provincial capital to the industrial center of all Spain dates from about 1868 when it ceased to be a walled town and started on its present career of industrial development. Since that time the town has had a marvelous growth; it has doubled in area and its population has increased in hardly less a degree. The new city with its broad avenues and busy inhabitants furnishes a marked contrast to the contracted and idle towns of the south. The Catalan population, indeed, is remarkable for thrift, patience and industry, and well deserves the name often given them—the Germans of Spain.

Less than a decade passed after the beginning of the revival of Barcelona before the increase of the sea-going trade brought into notice the necessity of improved harbor facilities. The harbor of Barcelona—if the small indentation of the coast line could be called such—was shallow and exposed to hard winds from the east and southeast which made the handling of freight difficult at all times and especially during the rainy season. The plan of the harbor as then in use was the same as when originally laid out in 1474, and it was therefore entirely unsuited to accommodate modern shipping. The movement for improving the conditions culminated in 1880 in a plan for a harbor on truly modern lines. Too much credit can hardly be given to those who undertook the project for it meant practically the creation of an entirely new harbor in shallow water on a sandy coast that offered almost no natural advantages.

As planned in 1880 and since improved the harbor consists of two basins. Two long moles enclose it on the east and south, the coastline forming an irregular third side to the triangle. The inner and northern basin lying nearest to the heart of the city is even now unable to accommodate large sea-going vessels as its depth is only seven meters at the deepest point while the average is between five and six. Between the inner and the outer basins lie three moles two of which serve as docks, while upon the third one, which is detached, the office of the customs house is situated. By this arrangement the customs offices are almost in the center of the harbor. In the outer basin a floating dry dock is located which can accommodate medium sized vessels. In both basins it is planned to have a well developed comb of docks, those in the inner basin being already completed. Along the docks of the inner harbor spacious warehouses have now replaced the inadequate sheds which were formerly the only protection for goods needing storage. Nearly 1,500,000 square feet of storage space is now provided. In this built-up portion of the harbor there is a length of docks of over 13,000 feet with a width varying from 100 to 400 feet. The machinery for unloading has recently been much improved and is at present adequate for the needs of the port. The equipment includes, besides the numerous small portable cranes, seventeen hydraulic cranes of twenty-five tons capacity, two floating cranes of twenty-five tons and one of eighty tons. An electric grain elevator has also recently been installed. But little progress has been made in building up the comb-docks in the outer basin and consequently the commerce in

vessels of deeper draft is still hampered by lack of space necessitating delays in unloading upon the shore wharves.

The depth of the water in the outer basin varies from seven to fifteen meters. Systematic dredging has improved the center of the area to a depth of ten meters, but the lack of sufficient water continues to be one of the greatest hindrances to the satisfactory management of the deep-sea traffic.

The rapid development of the city has already given indication that the harbor, even when deepened satisfactorily, will still remain inadequate, and a new breakwater is being extended toward the south which will enlarge the water area of the harbor to almost twice its present size. Large blocks of concrete weighing as much as eighty tons are sunk to form the foundation for this mole. The extension is rendered especially desirable on account of the heavy seas that make waiting outside the harbor dangerous in stormy weather. Increased protection to the shipping during adverse weather conditions is in fact an absolute necessity if the city is to continue its present commercial development.

One of the greatest handicaps of the port of Barcelona in the past has been the inadequacy of the coal supply. In spite of efforts by the Cortez to encourage the production of Spanish coal, no satisfactory development of this branch of the country's resources has occurred, and the chief dependence for sea vessels is now, as formerly, upon English mines. Up to 1902 the Spanish duties on imported coal were levied on all that came into the country irrespective of its destination. In that year, however, an English company, backed by the commercial interests of Barcelona, secured a special concession from the central government allowing them to construct a floating coal hulk in the outer harbor, all coals shipped to which were to be used in bunkering sea-going vessels and to be free from the customary duties. This has so reduced the cost of coal in the port that a decided increase has taken place in the number of ships bunkering here.

At present two floating coal docks are maintained capable of discharging coal at the rate of from 500 to 700 tons daily. On account of the extra charges for the higher speeds, however, the usual rate is from 300 to 400 tons per day of ten hours. The company has recently begun the installation of electric discharging machinery with a capacity of from 800 to 900 tons per day.

The depth of water at the usual discharging berth is twenty-three feet, although steamers of twenty-seven feet draft can be accommodated. The increased demand for coal due to these improved bunkering facilities, has raised the consumption of the port to over 700,000 tons per year of which 550,000 tons are from England. So successful has the project been indeed, that the same company is now negotiating for the extension of its privileges to the ports of Southern Spain, especially Valencia.

The control of the port and port charges rests in two authorities—one local and one central, though a single set of officers in most cases supplies both services. The central government, in pursuance of a comprehensive plan for the maintenance and improvement of all Spanish harbors, makes what is called a "transport tax" of 2.30 pesetas (about thirty-six cents)

per ton, and a local "port-works" tax of an equal amount is levied for and administered from Barcelona. Independence of action in the local authorities is, however, apparent rather than real, as all the plans for extensions or for special concessions are subject to review at Madrid.

On the whole, this control by the central authorities seems to have been exercised with intelligence and with a realization of the local needs. The commerce has steadily grown, and though the harbor is not yet equal to the demands of the industrial interests of the city, still it is a credit to the community it serves. The extent to which the port of Barcelona has entered into the commerce of the world, does not, of course, bear comparison with the thriving centers farther to the north, but when compared with the decadence of a generation ago the showing is satisfactory indeed.

There are at present the following services: Two steamers a month from Barcelona to New York regular lines going to Alexandria, Egypt and the Mediterranean ports, and sixteen Spanish shipping companies with regular sailings from Barcelona. Besides this the city is a port of call for five Italian, four French, three British, two Austrian, two German lines and one each of Belgian, Dutch and Norwegian nationality.

This is a showing unequaled by any other port of the Kingdom, and remarkable when the conditions of a generation ago are called to mind. The prosperity of Barcelona and the condition of its ports are tributes to the industry and genius of Catalonia, and the most reassuring signs of the development desired by "Young Spain" for the country as a whole.

ANTWERP, BELGIUM

By HENRY RALPH RINGE, Philadelphia

The port of Antwerp, located sixty miles from the mouth of the River Scheldt, is situated in the center of a rich and thickly populated manufacturing district, and is a most convenient exit for the greater part of the trade of Europe, since it takes the trade of Belgium, Northeastern France and part of Germany.

The trade is continually assuming larger proportions, an evidence of which is the fact that in 1902 Antwerp was the headquarters of sixty shipping companies. The growth in the amount of shipping entered at the port is shown by the following table:

Date.	No. of ships.	Tonnage
1880	4,626	3,117,754
1890	4,532	4,517,698
1899	5,420	6,842,163
1904	5,852	9,398,503
1905	6,034	9,846,707

Slightly more than one-half of the tonnage consists of imports, the principal articles being grains of all kinds, raw textile materials, mineral ores,

provisions and animal products. The exports, on the other hand, are manufactured articles, wrought metals, railway carriages, cement and glassware.

The River Scheldt, a winding river with banks of sand, has a tidal variation of between twelve and twenty-five feet at Antwerp. At the river front it is between three hundred and fifty and six hundred yards wide, and at extreme low water will admit vessels drawing twenty-five feet.

This tidal variation has made necessary a system of docks with an unchanging water level for the convenient loading and unloading of smaller vessels, and the width and depth along the river front has made possible its utilization for the construction of a fine system of quays for the use of the large ocean liners.

There are eleven docks which range in length from five hundred and seventy-four feet to two thousand six hundred and forty feet. All are connected with sluices. The sides of the docks are crowded with warehouses, and all are equipped with the modern loading and unloading facilities. The widest entrance to the docks is seventy-eight feet and the depth is twenty-one feet, thus the larger vessels cannot enter except for drydocking when light.

The system of quays is growing very rapidly and now exceeds three and one-half miles in length. The water at the quays is twenty-six feet deep at low tide, the mean rise of the tide being fourteen feet.

In 1902 the quays and docks could accommodate about two hundred and twenty vessels at one time, but even this proved insufficient to meet the growing requirements of the port, so an extension was decided upon which would accommodate twenty more vessels.

The facilities for unloading the vessels are very unusual. There are fifty miles of railway around the quays and docks, and the goods intended for immediate delivery can be transferred directly from the vessel to the railway trucks, or, if it is merchandise to be transshipped, the corporation wagons are in attendance to transport it immediately from one vessel to another. There are about two hundred hydraulic traveling cranes, which lift the goods directly from the ships into the sheds. These sheds extend all along the sides of the quay within twenty-five feet of the front. They are about one hundred and seventy-five feet wide and are divided by spaces just sufficient to allow the railway trucks to pass from the front to the rear of the shed. After the goods are landed the merchants are allowed four or five days in which to clear their goods from the sheds free of charge. After this time the authorities can place the goods where they choose at the expense of the merchant.

The municipality is the port authority at Antwerp, and all the management, with the exception of the private warehouses, is in its hands. The docks are solely the property of the city, but the quays along the river side are not absolutely the property of the city, since they were constructed some years ago with the funds partly provided for by the government and partly by the City of Antwerp. An arrangement exists between the town authorities and the government by which the municipality receives all dues and then pays the government a certain proportion.

The working of the port is controlled by the town council, who are advised by a committee, which includes the chief engineer of the town, the chief engineer of state railways, the inspector of customs and the president of the chamber of commerce. The government of Belgium also exercises an effective control because it acts as conservators of the river and aids in carrying out the extension of the quay walls and the river accommodations. The government gets no interest on its outlay, but is paid thirteen-fifteenths of the earnings of the quays until its capital outlay is repaid.

The port of Antwerp has exceedingly low charges for port dues. This is partly because of the fact that the imperial government has largely contributed to the cost of improvements and has foregone all imperial dues, and partly because the municipality has made it a point to keep the charges on shipping as low as possible. The port expenses of the shipowner are best considered under two heads: First, port dues, and second, port charges. The port dues per ton net register are about $10\frac{1}{2}$ cents per ton at the docks and about .06 3-10 cents at the quays. These charges are subject to a reduction on a vessel making repeated voyages in a year. The port charges are better understood by dividing them into two heads:

1. Charges in connection with the navigation of the vessel, namely, pilotage.

2. Charges in connection with the cargo, namely, loading and unloading.

These are different from the dock dues, since they are for direct personal services and have to be paid either directly to the individuals or indirectly through the authorities to whom the individuals are responsible. The pilotage at Antwerp is compulsory and is a little over $7\frac{1}{2}$ cents per ton net register; while the expenses for discharging the cargo, which consists in passing it from the vessel to the consignee or those receiving it in his behalf on the quay, depend upon the price of the labor of the dockers, which is about one dollar per day.

Many suggestions have been made for improving the harbor, but the most important so far offered is to divert the River Scheldt by making a cut across the bend in the river, known as the *Grande Coupure*, and to utilize one of the banks for new river berths. The people of the City of Antwerp are not eager for this change, but would rather have one long dock over practically the same route as the *Grande Coupure*, with locked entrances at both ends, and then from this main dock have several branch docks. All the land necessary for the scheme is to be purchased by the government and then additions gradually will be made.

Another very valuable suggestion has been made in regard to the sheds. The authorities are not satisfied with the open sheds and have proposed the scheme of having sliding doors. They also propose to have a double line of sheds three hundred and fifty feet wide, so that the front shed could be used for outgoing goods and the rear shed for incoming goods. This, together with a corresponding increase in the number of rails, will be a most valuable addition to the facilities for handling the cargoes, and when these suggestions are carried out, which in all probability will be soon, Antwerp will be able to welcome any great increase in trade with adequate facilities.